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KITAJIMA (K.). **Researches on the discolorations of logs of Fagus crenata Blume caused by Endoconidiophora bunae n.sp. and on its preventive method.**—Reprinted from *Bull. imp. For. exp. Sta.*, 35, 134 pp., 12 pl., 1936. [Japanese, with English summary. Received June, 1937.]

*Endoconidiophora* [*R.A.M.*, xiv, p. 729] *bunae* n.sp., the agent of a streaky, brown discoloration [cf. next abstracts] of the sapwood of freshly cut beech (*Fagus crenata*) [*F. sieboldii*] logs in the Shigetomi forest, Gokan, Japan, is characterized on soy agar, according to its English and Latin diagnoses, by brown hyphae, 4·5 to 6 $\mu$ in diameter; carbonaceous, globose perithecia, 104 to 243 $\mu$ in diameter, furnished with beaks 304 to 609 $\mu$ in length, covered with brown setae, 84 to 124 $\mu$ in length, and provided with ostioles surrounded by 7 to 21 hyaline filaments 10 to 63 $\mu$ long; reniform, hyaline ascospores, 3·9 to 4·8 by 2·2 to 4·3 $\mu$; hyaline microconidiophores, 28 to 30 $\mu$ in length, with a basal diameter of 5 $\mu$ and tapering to the apex, producing endogenous, hyaline, cylindrical microconidia, 7 to 7·8 by 1·4 to 2·2 $\mu$; and hyaline macroconidiophores, 63 to 70 by 7·2 to 8·4 $\mu$, producing endogenous, hyaline, ovoid conidia, 8·4 to 14·4 by 7·2 to 9·6 $\mu$.

The staining activity of *E. bunae* reaches a climax during the damp, warm weather of July and August, when infection may develop on the ends of the logs 7 to 10 days after cutting, seriously impairing the colour, texture, and clearness of the grain, though apparently not damaging the wood fibres. Inoculation experiments with the fungus gave positive results on its own host, *Quercus glandulifera*, *Zelkova acuminata*, *Magnolia hypoleuca*, and other timbers, *Pinus densiflora* remaining immune.

In experiments under controlled conditions no appreciable growth was made by *E. bunae* below 10° or above 30° C., the optimum temperature for development being about 26°. At or below a moisture content of 20 per cent. of the oven-dry weight of the wood there appears to be no risk of staining, but at or above 37 per cent. the mycelium grew vigorously, the wood was extensively discoloured, and numerous perithecia were formed. Properly air-seasoned or kiln-dried wood, therefore, should be impervious to infection from this source during storage.

Of the various media tested, soy, potato, and carrot were the best among the solid, and Peffer's and Currie's solutions the most suitable

liquids for the growth of *E. bunae*, which was found to require only a scanty supply of oxygen for its development. The use of Bavendamm's tannin technique [ibid., viii, p. 281] indicated that the fungus secretes some powerful oxidizing ferments. In mixed cultures the mycelium of *E. bunae* overgrew that of all species of *Ceratostomella* tested except *C. pilifera* [ibid., xvi, p. 358], whereas *E. bunae* in its turn was overrun by the mycelia of various other wood-destroying fungi included in the tests.

Various standard timber preservatives having proved ineffectual against the brown stain induced by *E. bunae*, the writer formulated a number of preparations for coating the ends of the logs, of which the following (the proportions being given by weight) proved the best adapted for the purpose: (No. 18) denatured alcohol 26, rosin 48, slaked lime 4, aspest powder 10·5, and coal-tar creosote 10 [totalling 98·5]; (No. 24) wood tar 69, pine pitch 26, and slaked lime 5. The costs of the treatments are 20 and 14 cents, respectively, per cu. m. Directions are given for their application at various seasons. *F. sieboldii* trees should not be felled in July, when the cortex, which provides a certain protection against the entrance of wood-staining and wood-destroying fungi, is most easily detachable.

Goidànich (G.). **Le alterazioni cromatiche parassitarie del legname in Italia. IV. I parassiti del legno di conifere.** [Parasitic staining of timber in Italy. IV. The parasites of conifer wood.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 4, pp. 225–270, 3 col. pl., 37 figs., 1937.

A detailed account with Latin diagnoses is given of the author's comprehensive study of the morphology and taxonomy of the chief staining fungi attacking conifers [see preceding abstract] in Italy and of the nature of the injury produced [cf. *R.A.M.*, xv, pp. 129, 412; xvi, p. 5].

*Ophiostoma piliferum* (syn. *Ceratostomella pilifera* and *C. coerulea* [ibid., xiv, p. 702; xv, p. 185]) [a revised description of which is given] is stated to be one of the most injurious of staining fungi, spreading in the medullary rays and resin ducts and, to a lesser extent, in the tracheids.

*Graphium silanum* n.sp. isolated from *Pinus sylvestris* has hyphae 1·5 to 6 (usually 2·5 to 3) $\mu$ in diameter. The rigid coremia measure 370 to 680 by 45 to 90 $\mu$ and widen out at the top to 190 to 240 $\mu$ broad. The colourless, almost cylindrical, round-ended conidia measure 3·5 to 4·8 by 1·7 to 2·4 $\mu$ and arise singly or in groups of 2 or 3 at the tip of the synnematous hyphae. Secondary, oval conidia, attenuated at the base, 4·5 to 7 by 2·5 to 4 $\mu$, are borne on spicules at the apex of the primary conidia, and these in turn bear others. The fungus produces irregular, chestnut-grey, elongated spots penetrating the wood to a considerable depth.

From *P. pinea* the author isolated a fungus which he identified from its cultural characters as *G. penicillioides* [ibid., x, p. 71], but which he regards as the coremial form of *O. piceae* (Münch) Nannf. Sclerotia were developed in culture. The fungus causes spotting of a not very intense blue.

*Grosmannia ips* [ibid., xv, p. 827] was found on the bark (only) of

*P. pinea*, its first record in Europe. *G. serpens* [loc. cit.] causes a rather deep blue spotting of the wood of *P. pinea*, mostly at the periphery of the trunk. *Sphaeropsis ellisii* var. *chromogena* [ibid., xv, p. 412] was again isolated from *P. pinea* in 1936. *Trichoderma lignorum* and *T. koningi* [ibid., xvi, p. 575] are considered by the author to have some significance in the etiology of timber staining, though causing only a superficial discoloration without affecting the anatomical structure of the wood; the latter has been recorded on wood pulp, but has not been found associated with timber diseases.

*Fusicoccum tingens* n.sp. was isolated from the wood of *P. pinea*, in which it produced long, deep, narrow, olive-green spots spreading from the periphery towards the centre of the woody cylinder. In culture the mycelium was very dark green to black and the surface of the colony smooth and shining, later becoming covered by a black aerial mycelium of irregular, toruloid cells. Finally large, light grey, scattered masses of closely packed hyphae are formed, sometimes bearing a drop of yellowish liquid at the top. Fructifications are not produced readily either on artificial media or on wood. Only in very old cultures on malt agar has it been possible to obtain fertile pycnidiferous bodies which allowed the author to identify the parasite. These bodies are fairly large and covered with grey mycelium. The rounded loculi were lined with hyaline, cylindrical sporophores, 9 to 25 by 2·3 to 3·5 $\mu$, slightly tapering at the apex where they bore hyaline pycnospores, 20·5 to 24 by 6 to 7 $\mu$, at first cuspidate but becoming regularly fusiform when free. Artificial infection experiments showed the fungus to be of exceptional virulence and activity.

Groth (H.). **Förekomsten av 'dowicide'—utslag i Finland och möjligheterna att förebygga uppkomsten av detsamma.** [The occurrence of 'dowicide' eruption in Finland and the possibilities of preventing its development.]—*Papp. Trävarutidskr. Finl.*, *1937*, 4, pp. 126–128, 1937. [German summary.]

The use of dowicide [*R.A.M.*, xvi, p. 428] for the control of 'blueing' of timber [*Ceratostomella* or *Ophiostoma* spp. and other fungi: ibid., xvi, p. 74, and preceding and next abstracts] is stated to have saved the Finnish industry at least M. 60,000,000 annually, but is attended by one disadvantage in the form of a mild dermatitis affecting 173 out of 1,039 workmen in 26 sawmills under the writer's inspection. The disturbance may be reduced to a minimum by the adoption of appropriate prophylactic measures, such as the wearing of rubber gloves, the application of grease to the hands and arms, and the like.

Sahlman (E. J.). **Discoloration of timber logs.**—*Papp. Trävarutidskr. Finl.*, *1937*, 5, p. 159, 1937.

Of various storage methods tested in Finland in 1936 the two giving the best control of staining in pine logs [*Ceratostomella* or *Ophiostoma* spp. and other fungi: see preceding abstracts] were stacking (*a*) in overlapping rafts and (*b*) in piles continually sprinkled with water (Runbäck's method); in these two lots the incidence of discoloration was only about 5 per cent., compared with 8·5 and 74 per cent. for open rafts and dry piles, respectively.

HAHN. **Erfahrungen mit Holzimprägniermitteln.** [Experiences with timber preservatives.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 13, pp. 140–141, 1937.

Excellent results are reported by a nurseryman at Hagen, Westphalia, in the preservation of the woodwork of glasshouses and frames by immersion for 4 to 12 hours in a 20 per cent. solution of antorgan [*R.A.M.*, xv, p. 479]. It is estimated that the durability of Thuringian pine wood is increased by 22 to 25 years by the treatment.

SCHEFFER (T. C.) & LIVINGSTON (B. E.). **Relation of oxygen pressure and temperature to growth and carbon-dioxide production in the fungus Polystictus versicolor.**—*Amer. J. Bot.*, xxiv, 3, pp. 109–119, 4 graphs, 1937.

In experiments described in this paper *Polystictus versicolor* [*R.A.M.*, xvi, p. 139] was grown on malt agar strips in special culture tubes through which water-saturated gas flowed continuously at the rate of 15 l. a day, at oxygen pressures maintained at 0, 1·5, 10, 16, 37, 115, 152, 381, and 745 mm., and at temperatures of 17·5°, 21·5°, 25·5°, 29·5°, and 33·5° C. The minimum oxygen pressure for mycelial growth was found to be between 1·5 and 10 mm. for all the temperatures. For a pressure range of 37 to 745 mm. the growth rate showed little or no effect of the pressure at any temperature, while for each oxygen pressure the optimum and maximum temperatures were about 29·5° and 35°, respectively. Carbon dioxide production per unit area of mycelial mat at oxygen pressures ranging from 0·0 to 745 mm. and at all temperatures tested was in general more rapid, but decreasingly so, as the oxygen pressure rose, and was two to five times as fast with almost pure oxygen as under anaerobic conditions. No minimum, optimum, or maximum oxygen pressure was observed for carbon dioxide production at any temperature. Growth was most rapid for combinations of 29·5° with oxygen pressures of 15 to 745 mm. Carbon dioxide production was most rapid per mat unit at combinations of 33·5° and 745 mm., and slowest at those of 17·5° and 0 mm. pressure. An index of growth efficiency in relation to carbon conservation was obtained by dividing the growth rate for any temperature-oxygen combination by the corresponding rate of carbon dioxide production per unit of mat area. Growth took place with relatively the least loss of carbon when the pressure was near the minimum permitting growth, temperature having very little effect in this connexion. Loss of carbon was relatively most rapid at combinations of 17·5° and 33·5° with 745 mm. pressure. For each oxygen pressure over 15 mm. the coefficient of growth efficiency was greatest for 25·5°.

The data obtained indicate that decay by wood-destroying fungi may be more rapid the more completely the wood is aerated, provided that its water content is sufficient for the requirements of the fungus. The optimum temperature for decay probably lies above the optimum but much below the maximum for mycelial growth. For time intervals and wood zones involving a limited range of decay stages, destruction of wood is probably slowest in proportion to the spread of infection

when low oxygen pressure is accompanied by temperatures below the optimum for fungal growth.

PETERS (F.), KRIEG (W.), & PFLUG (H.). **Toximetrische Prüfung von Steinkohlenteerimprägnieröl nach der Klötzchenmethode.** [The toximetric testing of coal tar impregnation oil by the wood-block method.]—*Chemikerztg*, lxi, 26, pp. 275–278, 1 diag., 1937.

Details are given of experiments carried out by the standardized wood-block method [*R.A.M.*, xvi, p. 503] to disprove Bateman's contention that coal tar impregnation oil consists largely of non-toxic materials which merely serve as carriers of the fungicidal principle [ibid., v, p. 398]. The fungi used in the tests were *Coniophora cerebella* [*C. puteana*], *Polyporus vaporarius* [*Poria vaporaria*], *Lenzites abietina* [ibid., xvi, p. 292], and *Lentinus squamosus* [ibid., xv, p. 623]. The resultant data clearly showed that most of the ten constituents of the impregnation oil used by the German State Railways and Postal Service are of a high degree of toxicity and none can be regarded as non-fungicidal in Bateman's sense, though certain high-boiling components [ibid., xvi, p. 78], e.g., the after-run of neutral oil and anthracene expressed residue, exert a relatively weak action on *P. vaporaria* and *L. squamosus*.

**British Standard specifications for coal tar creosote for the preservation of timber. (Types A, A2 and B.) (Revised July 1936.) No. 144—1936.**—17 pp., London, British Standards Institution, 1936.

British Standard type A creosote [cf. *R.A.M.*, xvi, p. 430] consists essentially of a distillate of coal tar free from any admixture of petroleum or similar oils. The specific gravity of the material at 38° C. compared with water at 20° may not be lower than 1·010 or higher than 1·065. The material must become completely fluid on gradual warming to 38° with stirring, and on cooling remain completely fluid after two hours' standing at 15·5°. The distillates of 100 gm. of dry material at 205°, 230° C., and 315° may not exceed 6, 40, and 78 gm. respectively, and the residue must be soft and not sticky. The material must contain not less than 5 or more than 16 per cent. by volume of tar acids, and must not yield more than 0·4 per cent. by weight of matter insoluble in benzole.

The specific gravity of creosote type A 2 may not be lower than 0·995 or higher than 1·065. When creosote from low temperature tar is ordered, the specific gravity may not be lower than 0·935 or higher than 1·065. The material must become completely fluid on gradual warming to 38°, and on cooling remain completely fluid after two hours' standing at 32° or at 15·5° if required for brush applications. The distillates may not exceed 6, 40, and 85 gm. respectively at 205°, 230°, and 315°. At least 5 per cent. by volume of tar acids must be present.

The specific gravity of creosote type B (from coal tar made in Scotland) may not be lower than 0·995 or higher than 1·065. When creosote from blast furnace tar is ordered, the specific gravity may not be lower than 0·935 or higher than 1·065. The fluidity, water content, distillation, tar acid, and benzole-insoluble matter requirements conform to those given for A 2.

BERTRAND (G.) & SILBERSTEIN (L.). **Nouvelles déterminations de la teneur en bore de plantes cultivées sur le même sol.** [Further determinations of the boron content of plants cultivated on the same soil.]—*C.R. Acad. Sci., Paris*, cciv, 13, pp. 1019–1021, 1937.

In further analyses of the boron content of ten cultivated plants and four weeds grown continuously in the same plot [*R.A.M.*, xvi, p. 81], meadow grass [*Poa pratensis*], like the other Gramineae, was found to be extremely poor in this element (3·1 mg. per kg. of dry matter), while the onion, with only 4·3 mg., resembled the leek. The relatively high boron content of various Leguminosae was again manifested to a varying extent by broad bean [*Vicia faba*] (16·5 mg.), lucerne (28·9), and bird's foot trefoil [*Lotus corniculatus*] (36·6). Other determinations include flax (7·1 mg.), celery (11·9 and 15), potato (13·9 and 15), and tomato (15 and 19).

KOOPMAN (C.). **Invloed van mangaansulfaatbespruiting tegen kwaadhartigheid bij Schokkererwten.** [The influence of manganese sulphate spraying on marsh spot of Schokker Peas.]—*Tijdschr. PlZiekt.*, xliii, 3, pp. 64–66, 1937.

Miss Löhnis's studies having indicated a correlation between manganese deficiency and marsh spot of peas in Holland [*R.A.M.*, xv, p. 767], the writer treated plots of Jumboka Schokkers (coarse-seeded) and Zelka Schokkers (fine-seeded) with a solution of 1 per cent. manganese sulphate, the first application being made just after the close of flowering, and the second about three weeks later. In one test the incidence of the disorder was reduced from 27·75 and 8 per cent. in Jumboka and Zelka, respectively, to 6 and 0·75 per cent., respectively, while the corresponding figures in another trial were from 32·5 and 11 to 10·25 and 0·5 per cent., respectively. The extreme susceptibility to marsh spot of the Jumboka variety renders it particularly suitable for use in control experiments with manganese sulphate, the use of which may possibly result in increased yields, but in this respect the present data, though suggestive, are not altogether convincing.

OVINGE (A.). **Kwade harten in Schokkers.** [Marsh spot in Schokker Peas.]—*Tijdschr. PlZiekt.*, xliii, 3, pp. 67–73, 1937.

The beneficial effect of manganese sulphate on Schokker peas affected by marsh spot [see preceding abstract] was demonstrated in tests in Zealand in 1935–6, in which the compound was applied to the soil between the rows at the rate of 100 or 200 kg. per hect., somewhat better results being obtained with the double quantity. In a test to determine the correct time for the manganese sulphate treatment (100 kg.), a healthier stand was secured by applying the compound just as the plants were about to flower than when they were only about 10 cm. in height. Further experiments are necessary to ascertain the influence of the treatment on yield, but a tendency to enhanced productivity is indicated by the fresh green foliage and late ripening (ten days or so after the controls) of the plants given 200 kg. manganese sulphate per hect.

STAPP (C.). **Der bakterielle Stengelbrand der Erbsen.** [The bacterial stem blight of Peas.]—*Zbl. Bakt.*, Abt. 2, xcvi, 1–4, pp. 1–17, 7 figs., 1937.

In June, 1934, the progeny of a cross between Schurig's Early and Grünbleibende Schnabel peas, growing in sandy soil, were observed to be affected by a disease corresponding in external and internal symptoms to the bacterial stem blight (*Pseudomonas pisi*) occurring in the United States [*R.A.M.*, ix, p. 700; xii, p. 263; xiii, pp. 3, 76], both parents remaining healthy. The organism isolated from the vascular bundles, parenchymatous tissue, and pith of diseased plants differed in certain respects from that originally described by W. G. Sackett (*Bull. Colo. agric. Exp. Sta.* 218, 1916) as *P. pisi*. The average dimensions of the seven German strains subjected to intensive study were 1·2 to 2·2 by 0·6 to 1 $\mu$, 1 to 1·8 by 0·6 $\mu$, and 1·2 to 2 by 0·5 to 0·7 $\mu$ on bouillon, potato, and carrot agar, respectively, compared with 1·11 to 3·28 by 0·58 to 0·82 $\mu$ for the American specimens, while the latter was reported to be uniflagellate and the number of flagella in the German strains ranges from 1 to 5. Sackett mentions no involution forms, which were highly characteristic of the writer's material. A number of other physiological and biochemical deviations from the type were observed, but are not considered sufficiently important to raise any doubts as to the identity of the German organism. The results of serological experiments indicated a relationship between *P. pisi*, *P.* [*Bacterium*] *medicaginis* var. *phaseolicola*, and *P. tabaci* [*Bact. tabacum*].

None of the 37 varieties inoculated with potato agar suspensions of *P. pisi* proved to be immune from infection, but a fair degree of resistance was shown by Heine's Folger and Victoria, Kortstroo Schokker 2517, Meyer's Friedeburg Victoria, Nordost small white, Strube's early Victoria, and Werther's Jena Victoria, while Pluk, Nordost early green and P.S.G. large yellow hybrid were among the most susceptible.

The control measures recommended by various workers are briefly indicated.

STUBBS (M. W.). **Viroses of garden Pea.**—*Phytopathology*, xxvii, 3, pp. 242–266, 3 figs., 1937.

In this amplified, tabulated account of the writer's studies in Wisconsin during 1933–4 on pea viruses, a condensed version of which has already appeared [*R.A.M.*, xv, p. 551], peas and sweet peas are newly recorded as susceptible to tobacco ring spot, which infected more or less severely all 34 varieties of the former used in inoculation tests, causing top necrosis of the seedlings with occasional rings on the leaflets not killed and a conspicuous brown discoloration of the stem. Host range experiments revealed important differences between pea virus 1 (enation mosaic) [ibid., xvi, p. 517] and the other three mosaic viruses distinguished as 2A (marble), 2B (speckle), and 2C (mild). The first-named infects peas (including Perfection), crimson clover (*Trifolium incarnatum*), broad beans (*Vicia faba* var. *minor*), Midwest soybeans, sweet peas, and yellow sweet clover (*Melilotus officinalis*), but not red clover (*T. pratense*), garden beans (*Phaseolus vulgaris*), or white lupin (*Lupinus alba*). The other three attack peas (excluding Per-

fection), *T. incarnatum*, *V. faba* var. *minor*, *M. officinalis*, and *L. alba*, but not *T. pratense*, *P. vulgaris*, or soy-beans. In seed transmission tests 3 questionable cases of infection occurred in 13,328 seedlings.

WELLMAN (F. L.). **Control of southern Celery mosaic in Florida by removing weeds that serve as sources of mosaic infection.**—*Tech. Bull. U.S. Dep. Agric.* 548, 16 pp., 4 figs., 1937.

Southern celery mosaic [*R.A.M.*, xv, p. 191] is stated to have been satisfactorily controlled in the Sanford district of Florida by the complete eradication of all weeds for a distance of 75 ft. or more round the seed-beds before planting and by the removal of weeds, especially *Commelina nudiflora*, from a similar radius round fields, beginning before transplanting and repeating about five times during the growing season. Inoculation experiments on over 10,000 celery plants, comprising 77 varieties or strains, gave positive results in every case, and no resistance to mosaic was shown by any of the standard varieties used locally or comparable foreign types.

NELSON (R.) & LEWIS (R. W.). **Comparative effectiveness of copper dusts in the control of Celery leaf blights in 1936.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xix, 3, pp. 159–162, 1 fig., 1937.

In a further comparative test carried out in Michigan in 1936 on the control of early blight (*Cercospora apii*) and late blight (*Septoria* spp.) [*S. apii* and its var. *graveolentis*] [*R.A.M.*, xv, p. 552] Michigan Golden celery dusted at the rate of 40 lb. per acre per application on 2nd, 9th, 16th, 22nd, and 27th July with copper sulphate-lime (standard 20–80) and two commercial dusts, one containing 7 per cent. red copper oxide and the other 7 per cent. basic copper sulphate, each dust supplying equivalent quantities of copper, showed, respectively, 94·5, 72·4, and 78·5 per cent. control, taking the amount of disease present on the untreated plots as equivalent to 0 per cent. control.

THORNBERRY (H. H.) & ANDERSON (H. W.). **Comparative studies on cultures of Phytomonas lactucae-scariolae, n.sp. and Phytomonas pruni.**—*Phytopathology*, xxvii, 1, pp. 109–110, 1937.

From the oily exudate issuing from angular, light brown lesions, 2 to 4 mm. in diameter, on wild lettuce (*Lactuca scariola*) leaves in Illinois the writers isolated a rod measuring 1 to 1·5 by 0·5 to 1 $\mu$, motile by 1 or 2 polar flagella, occurring mostly in pairs, non-spore-forming, Gram-negative, not acid-fast, forming round, entire, finely granular, amber-yellow colonies on dextrose agar, liquefying gelatine, reducing nitrates, peptonizing litmus milk, producing no gas from any of the sugars tested, aerobic, and with minimum, optimum, and maximum temperatures and hydrogen-ion concentrations of 7°, 25°, and 35° C. and $P_H$ 4·8, 7·5, and 11, respectively. Positive results were obtained in inoculation experiments with pure cultures of the organism, which is named *Phytomonas lactucae-scariolae* n.sp., on healthy wild lettuce plants, whereas the morphologically, biochemically, and culturally identical *P.* [*Bacterium*] *pruni*, a pathogen of the peach [*R.A.M.*, xv, p. 235], failed to attack *L. scariola*.

PIZER (N. H.). **Improvement of Mushroom composts. II.**—*Gdnrs' Chron.*, ci, 2620, p. 174, 1937.

Experiments at the South-Eastern Agricultural College, Wye, Kent, are stated to have shown that the cropping of mushrooms [*Psalliota* spp.: *R.A.M.*, xvi, p. 365] may be expedited and yields raised by the addition to the compost heap, during the final turning of the manure, of 14 lb. superphosphate per ton, mixed with an equal quantity of gypsum. A successful modification of this treatment consists in the dusting of 28 lb. of ground gypsum into each ton of manure as the first heap of compost is being made, while at the last turn the manure is again sprinkled with a mixture of equal parts by weight of ground gypsum and superphosphate at the rate of 28 lb. per ton.

DE GUERPEL (H.). **Les ennemis et les maladies du Soja.** [The pests and diseases of the Soy-bean.]—*Rev. Bot. appl.*, xvii, 187, pp. 195–201, 1937.

After pointing out that soy-beans in France have so far remained free from infection the author gives brief notes on the following diseases of this crop reported from Europe and America, viz., bacterial blight (*Bacterium glycineum*) [*R.A.M.*, xv, p. 632], *Bact. phaseoli* [var. *sojense*: ibid., xiii, pp. 210, 564], *Bact. sojae* [ibid., xiv. p. 87], a wilt (recorded from Japan in 1926) attributed tentatively to *Rhizobium beijerinckii* [*Pseudomonas radicicola*], mosaic [ibid., xiv, p. 82], leaf spot probably due to potash deficiency [ibid., xiii, p. 209], rust (*Aecidium glycines* R. Heim) [ibid., i, p. 207], *Cercospora cruenta* [ibid., xvi, p. 492], *Cercosporina kikuchii* [ibid., ix, p. 23], *Fusarium tracheiphilum* [ibid., xi, p. 88], *Glomerella cingulata*, browning of the roots caused by *Corticium vagum* [*C. solani*] (in India by a *Rhizoctonia* and in Trinidad by *Sclerotium rolfsii* [ibid., xiii, p. 540]), *Sclerotinia libertiana* [*S. sclerotiorum*: ibid., xi, p. 316], *Septoria glycines* [ibid., xi, p. 88], *Peronospora manschurica* [ibid., xv, p. 632], *Phyllosticta* [*Pleosphaerulina*] *sojaecola* [ibid., xi, p. 89], *Uromyces sojae* [ibid., vi, p. 74], and *Erysiphe communis*. The control measures recommended are seed disinfection and, if an outbreak should occur, spraying with Bordeaux mixture.

MAIER (W.). **Bormangelerscheinungen an Rebsämlingen in Wasserkulturversuchen.** [Boron deficiency manifestations in Vine seedlings in water culture experiments.]—*Gartenbauwiss.*, xi, 1, pp. 1–16, 10 figs., 1937.

The absence of boron from the nutrient solution (v. d. Crone's) in which vine seedlings were grown led to abnormal developments of various kinds, involving the death of the growing point of the shoot, the formation of short internodes, and small leaves, strongly rolled downwards and at first dark green but becoming yellow at the edges and between the veins, with petioles frequently swollen in the middle, while the production of lateral shoots was another conspicuous feature of the deficiency. The amount of boron (0·6 mg. per l. of nutrient solution) necessary to combat these disturbances was found to be contained in an aluminium-zinc solution (1 c.c. per l.) in which traces of numerous other elements are also represented; none of these, however,

was capable of taking the place of boron as an essential constituent of vine growth.

Arnaud (G.). **Action de divers métaux sur le mildiou de la Vigne.** [The action of various metals on Vine mildew.]—*C.R. Acad. Agric. Fr.*, xxiii, 2, pp. 64–67, 1937.

In this note (preceded by some introductory remarks by D. Bois) the writer states that good control of *Plasmopara viticola* on the susceptible Carignane vines was obtained in 1936 by five applications of 1 per cent. nickel sulphate, which equalled copper sulphate in efficacy. Silver sulphate at the same concentration caused such severe scorching as entirely to preclude its use for this purpose, and cobalt sulphate afforded only a slight degree of protection.

Kramer (O.). **Erfahrungen aus dem Peronosporajahr 1936.** [Experiences of the *Peronospora* year 1936.]—*Nachr. SchädlBekämpf., Leverkusen*, xii, 1, pp. 18–25, 4 figs., 1937. [English, French, and Spanish summaries on pp. 42–43, 46–47, 50–51.]

*Peronospora* [*Plasmopara viticola*] is stated to have been responsible for an almost unprecedented epidemic of downy mildew in Württemberg vineyards in 1936, the untreated test plots at the Weinsberg Experiment Station being practically defoliated by September and yielding not a single sound fruit. Where spraying was carried out on the dates recommended by the Experiment Station authorities, however, losses were negligible. If strictly followed the regulation schedule of five applications (at the most) of 1 per cent. nosprasen neutral or 1 to 1·5 or 2 per cent. (for final treatments) nosprasen [*R.A.M.*, xiv, p. 79], corresponding to the standard 1 to 1·5 per cent. Bordeaux mixture, should be ample for local conditions. A number of useful practical directions for spraying procedure are given.

Negrul (A. M.). Генетические основы селекции Винограда. [Genetical bases of Vine breeding.]—*Bull. appl. Bot. Select., 1936*, Ser. viii, 6, 150 pp., 16 figs., 1936. [English summary. Received June, 1937.]

This is a summarized and fully tabulated report of the work done in U.S.S.R. from 1928 to 1935, inclusive, in the development of new vine varieties by inter- and intraspecific hybridization, in an attempt to breed new types combining the best commercial qualities, together with adequate resistance to the more important diseases, pests, and adverse ecological factors. It also includes a detailed discussion of the genetical principles underlying the researches. It is shown, *inter alia*, that variations in resistance to mildew (*Plasmopara viticola*) occur both between vine species and between varieties of the same species, and that resistance is inherited. In crosses between resistant and susceptible forms inheritance of resistance is polymerous in character. While in general resistance is recessive in the $F_1$, various combinations of the parents and different crosses of one and the same combination give varying types of resistance in $F_1$ seedlings, and a different type of segregation in $F_2$, non-resistant forms being predominant in every case;

in breeding mildew-resistant varieties, therefore, the selection of the parent pairs is of great importance.

KOUDELKA (H.). **Vorläufige Mitteilung über die Entstehung der Markkrankheit der Weinrebe.** [Preliminary note on the origin of the pith disease of the Vine.]—*Nachr. SchädlBekämpf., Leverkusen*, xii, pp. 25–35, 11 figs., 1937. [English, French, and Spanish summaries on pp. 43–44, 47–48, 51–52.]

From vines affected with pith disease sent for inspection from Retz, Austria, to the Tetschen-Liebwerd (Czecho-Slovakia) Plant Nutrition Institute in the autumn of 1935, the writer isolated on an appropriate culture medium two fungi differing from *Pumilus medullae* [*R.A.M.*, xvi, p. 229] and here referred to as A and B, and two bacteria (I and II). Fungus A is a very rapid grower with a faintly reddish-yellow mycelium composed of exceptionally slender hyphae and producing two kinds of fructifications, namely, spherical to elongated, verticillate conidia and small, globular chlamydospores, developed in series and capable of immediate germination. Inoculations with this organism or bacterium I on the cut surfaces of healthy stocks of *Riparia portalis* gave positive results in the form of retarded growth, and weak shoots with short, thin, translucent shoots producing pale yellowish foliage. The effects of joint infection by fungus A and bacterium I were particularly noticeable, a marked feature being necrosis of the apical shoots. Characteristic of fungus A was a pronounced curtailment of growth, and of bacterium I a black foliar discoloration. An examination of the pith of vines inoculated with both organisms revealed an almost black discoloration of the nodes. Immediately above the 10th and 13th nodes was a very conspicuous constriction where the excentric distribution of the brownish-black, powdery pith involved its exposure. These symptoms agree with those observed in nature.

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1936.** [Review of phytopathological records noted in 1936.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 1–78, 4 figs., 1937.

This report [cf. *R.A.M.*, xv, p. 774] contains numerous items of interest, of which the following may be mentioned.

About 30 Verhanca vines grafted on Riparia Portalis in Trieste were affected by a bacterial disease resembling 'mal nero' [ibid., xiii, pp. 422, 492], and followed by secondary infection by a *Diplodia*, a *Macrosporium*, and an *Acremonium*. The affected branches were short, the internodes cracked, and the pith was brown and dead. The young shoots had short, hairy internodes which showed tobacco-coloured spots beneath which the cambium was necrosed and the lysigenous cavities were full of bacteria. The young leaves often bore dry, reddish, interveinal spots. The condition had appeared each spring for four or five years, the growth of the shoots becoming arrested after the emission of a few small leaves. Two bacterial organisms were constantly isolated from the diseased material, one cocciform and 0·5 to 0·6 $\mu$ in diameter, and the other truncated at the polar extremities, measuring 2·5 to 4 by 1·4 to 2 $\mu$ and arranged in chains.

Malvasia bianca vines (resistant to leaf roll) [ibid., xiv, p. 679],

grafted on to affected Negro amaro vines themselves grafted on American stocks, in no instance showed the presence of endocellular cordons [see below, p. 622], though these were found in the American stocks and the Negro amaro vines on them, and were beginning to appear in the Negro amaro vines on Malvasia bianca. Apparently, the last-named variety inhibits the pathogenic action of the virus on the embryonal tissues, but allows it to pass through them.

Olives at Messina have for some years shown a withering and brown discoloration of the branches, the condition being associated with a *Cytospora*, probably *C. oleina*, with hyaline, curved, irregularly shaped spores measuring 4 to 4·5 by 1·5 to 2 $\mu$; *C. elaeina*, which is probably identical with *C. oleina*, was also present.

Young Bergamotta Espérèn pears grafted on quince showed a necrosis of the bark that developed at the site of the graft and spread upwards and downwards. The cortical tissues contained a saprophytic *Sporotrichum* and a *Phytophthora* which on carrot agar formed piriform, papillate zoosporangia measuring 35·5 to 43·5 by 27 to 37 $\mu$, and round, yellowish, smooth-walled oogonia with paragynous antheridia. The spheroidal oospores had a smooth, thick, yellow wall, and measured 23 to 26 $\mu$ in diameter.

Apples were infected in the trunk and bases of the large branches by *Fusarium solani* var. *eumartii*; the affected bark became detached in strips and complete or localized withering supervened.

Apricots were severely infected by *Monilia* [*Sclerotinia*] *laxa* [ibid., xv, p. 233]. The most serious walnut disease in Italy is the root rot caused by a *Phytophthora* closely allied to *P. cambivora* [ibid., xv, p. 774]. New physiologic races of *Puccinia triticina* found in Italy [ibid., xvi, p. 89] were numbered 84, 85, and 86, according to Humphrey, Johnston, and Caldwell's revised classification (1936) making a total of 11 new physiologic races of this fungus in Italy.

Young *Sorghum saccharatum* plants showed a reddish leaf spot resembling that generally attributed to *Bacillus sorghi* [ibid., xi, p. 696].

Uppal (B. N.). **Appendix K. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1935–36.**—*Rep. Dep. Agric. Bombay, 1935–36*, pp. 203–207, 1937.

This report [cf. *R.A.M.*, xv, p. 482] contains, among others, the following items of interest. The seed of the homozygous strain D–IX of sann hemp [*Crotalaria juncea*] resistant to wilt [*Fusarium vasinfectum*: loc. cit.] was multiplied during the year. In newly planted gardens of betel vines [*Piper betle*] one sulphur application of about 50 lb. per acre effectively controlled powdery mildew [? *Oidium* sp.: ibid., xv, p. 78], but in old gardens two applications at an interval of about 1½ months were required, the total dressing amounting to about 90 lb. per acre. The cost amounted to 6 to 8 rupees per acre. Histological studies demonstrated that the fungus causing mango powdery mildew has globular haustoria and should be referred to *Erysiphe polygoni* [ibid., xv, p. 482]. The pathogenicity of a species of *Phoma* isolated from black spots on the stem end of ripe Alphonso mangoes was established on fruits of the same variety. *Oidiopsis taurica* [ibid., xv, p. 683] was found on *Cajanus indicus* [*C. cajan*], apparently for the first time

in India. Bordeaux mixture (3–3–50) applied at intervals of one month from November to February both gave control of fig rust [*Cerotelium fici*: ibid., xv, p. 778], while sulsol (2½ and 3 in 100) was effective but caused leaf-bronzing. Viable uredospores were collected throughout the year, indicating that in the Deccan *C. fici* perpetuates itself in the uredo stage.

In tests of the progeny of B.D. 8–6 and 8–26 cotton plants for resistance to *F. vasinfectum*, only 38 out of 710 plants survived for 45 days; of these, 26 showed no leaf mottle, and were transplanted to an infected plot for testing. Strains of new selection 12 tested in 1933–5, yielded 51 free from mottle out of a total population of 1,000 plants.

Numerous isolations from the diseased roots of 'mosambi' [orange] gave a *Fusarium* sp., the pathogenicity of which is to be tested.

CONNERS (I. L.). **Sixteenth Annual Report of the Canadian Plant Disease Survey, 1936.**—xi+88 pp., 1 map, 1937. [Mimeographed.]

In 1936, wheat stem rust [*Puccinia graminis*] caused only slight damage in western Canada [cf. *R.A.M.*, xv, p. 631]. As it appeared a week earlier than in 1935, and the weather favoured the disease during the last two weeks of June, enough inoculum was present in Manitoba to produce a severe epidemic, but subsequently all the cereal crops in the south of Manitoba ripened prematurely and the rust made little progress. It appears that the new rust-resistant variety Thatcher may be more susceptible to ergot (*Claviceps purpurea*) [ibid., vi, p. 406; xii, p. 275] than the bread wheat varieties commonly grown in western Canada.

Lucerne growing at Windermere, British Columbia, appeared to be affected by bacterial wilt (*Phytomonas insidiosa*) [*Aplanobacter insidiosum*: ibid., xvi, p. 104], a new record for Canada. Pea leaf spot (*Cladosporium pisicola*) [ibid., xiv, p. 71] was present in British Columbia, and rhubarb leaf spot (*Ramularia rhei*), apparently a new record for North America, was found at High River, Alberta.

*Pucciniastrum epilobii*, already recorded in Alaska on *Godetia* and *Clarkia*, now occurs on *Godetia* across Canada from Alberta to Prince Edward Island, and was recently observed on *Clarkia* in a greenhouse at Ithaca, New York. *Coleosporium campanulae* [ibid., xiii, p. 813] was found on *Campanula persicifolia* in Vancouver, the first Canadian record of the fungus. A leaf spot new to North America, *Gloeosporium mezerei* [ibid., vi, p. 597], caused heavy defoliation of *Daphne mezereum* in British Columbia. Stocks (*Matthiola* sp.) in Ottawa and Quebec were severely affected by foot rot due to *Fusarium avenaceum*. A new apple rot observed in New Brunswick was caused by *G. allantoideum* Peck, for which Dearness has erected the genus *Dasycarpoma*. Red raspberries in Ontario were affected in 1935 by what appeared to be a new virus disease, and was tentatively named 'yellow blotch'.

Applications of boron against apple drought spot and corky core [ibid., xvi, pp. 42, 325] are estimated to have increased the harvest in the Okanagan valley in 1936 by 40,000 boxes of perfect fruit. A yellowing of lucerne, common in patches and entire fields in the Okanagan and Kootenay valleys, was also ascertained to be due to boron deficiency.

*Cephalosporium* wilt of elms [ibid., xvi, p. 504] was observed in Nova Scotia, this being the first record of the disease in Canada.

The willow scab fungus (*Fusicladium saliciperdum*) [*Venturia chlorospora*: ibid., xiv, p. 479] caused heavy infection in the maritime provinces of Canada and eastern Quebec, and was more destructive in the Annapolis valley, Nova Scotia, than since 1928; it now occurs as far west as Louiseville, Quebec.

Bouriquet (G.). **Madagascar: list of the parasites and diseases of cultivated plants.**—*Int. Bull. Pl. Prot.*, xi, 4, pp. 66–68, 1937.

The following are among the records comprised in this continuation (extending to November, 1936) of the writer's list of Madagascan plant parasites and diseases [*R.A.M.*, xiii, p. 618]: *Bacterium albilineans* on sugar-cane [ibid., xvi, p. 562], *Alternaria tabacina* on tobacco [ibid., xiii, pp. 278, 804], *Bacterium phaseoli* on French beans [*Phaseolus vulgaris*: ibid., xvi, p. 441], and *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [ibid., xv, p. 422; xvi, p. 153] on gherkins [*Cucumis* sp.].

Burkholder (W. H.). **Serological reactions for the determination of bacterial plant pathogens.**—*Phytopathology*, xxvii, 4, pp. 572–574, 1937.

The writer views with some misgiving the growing tendency among plant pathologists to use the serological reactions of a bacterium as a quasi-infallible criterion of its specific identity. It has yet to be shown, in the genera *Erwinia* and *Phytomonas*, that serological characters are definitely correlated with biological properties, and pending convincing proof of such an association, it would seem wiser to rely on the more stable physiological features as a basis for bacterial plant pathogen classification.

Boivin (A.), Mesrobeanu (Lydia), Marbé (M.), Juster (P.), & Săvulescu (T.). **Sur la production de tumeurs chez la plante, au moyen de l'endotoxine non protéique du B. tumefaciens.** [On the production of plant tumours by means of the non-proteinic endotoxin of *Bacterium tumefaciens*.]—*Arch. roum. Path. exp. Microbiol.*, x, 1, pp. 67–78, 4 figs., 1937.

The authors isolated from *Bacterium tumefaciens* a glucidolipidic endotoxin capable of inducing in sunflower (*Helianthus annuus*) plants tumours comparable with those resulting from inoculation with the living organism [*R.A.M.*, xvi, p. 370], the sole difference being that the neoplasms arising from the endotoxin involved less of the primary cortex and caused a more pronounced hyperplasia of the central tissues than did the bacterium itself.

Ark (P. A.). **Effect of certain enzymes and amino-acids on crown gall tissues.**—*Science*, N.S., lxxxv, 2206, p. 364, 1937.

The rapid destruction of the galls induced on *Pelargonium zonale*, tomato, and sunflower (*Helianthus annuus*) by *Phytomonas* [*Bacterium*] *tumefaciens* [see preceding abstract] was effected by the injection of a mixture of *Erwinia carotovora* strains. Inferring from this phenomenon that enzymes or other specific compounds might be involved in the elimination of overgrowths, the writer introduced into tumours 3 to 5 cm. in diameter, produced on *P. zonale* and sunflower by a rose strain of

*Bact. tumefaciens*, a 0·1 per cent. aqueous solution or crystals of diastase, papain, pepsin, cysteine hydrochloride, leucine, isoleucine, tryosine, and tryptophane. In all cases except those of the plants treated with the two last-named substances, the galls gradually collapsed, shrivelled, and remained as hard vestiges readily detachable from the host. The action of papain and pepsin was specially prompt, while the time required for the mummification of the galls by the other compounds used ranged from ten days to a fortnight.

Conner (H. A.), Peterson (W. H.), & Riker (A. J.). **The nitrogen metabolism of the crown gall and hairy root bacteria.**—*J. agric. Res.*, liv, 8, pp. 621–628, 1937.

A brief account is given of biochemical studies of the nitrogen metabolism of *Phytomonas* [*Bacterium*] *tumefaciens*, a pathogenically attenuated sister culture of this organism, and of *P.* [*Bact.*] *rhizogenes* [*R.A.M.*, xvi, p. 191] in eight different nutrient media [the composition of which is indicated]. The results indicated that in media containing glucose and yeast infusion, approximately one-fourth to one-third of the total nitrogen was converted into cellular proteins. Both strains of the crown gall organism decreased amino nitrogen, but no decrease was observed in the case of the hairy root bacterium, indicating that it utilized and formed amino nitrogen at approximately the same rates. All the organisms slightly reduced the amount of ammonia nitrogen, and utilization of ammonia occurred in media to which ammonium salts were added. In similar media, except for glucose, large amounts of ammonia were formed, and protein nitrogen increased to about the same degree as in the presence of glucose. Both strains of the crown gall bacterium were able to utilize ammonium nitrate as the sole source of nitrogen in glucose-containing media, and ammonia nitrogen was more available than nitrate nitrogen. All the organisms readily utilized the polypeptide and amino nitrogen of peptone, resulting in an increase in cellular proteins and ammonia, while the fraction precipitated by tungstic acid was less readily available.

Stapp (C.). **Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens. V. Mitteilung. Der Einfluss von T.S.-Hormon (Follikel-Hormon) auf Tumorbildung und Gesamtentwicklung der mit Pseudomonas tumefaciens infizierten Wirtspflanzen.** [Crown gall of plants and its agent *Pseudomonas tumefaciens*. Note V. The influence of T.S. hormone (follicle hormone) on tumour formation and the general development of host plants infected by *Pseudomonas tumefaciens*.]—*Zbl. Bakt.*, Abt. 2, xcvi, 5–8, pp. 81–92, 1 fig., 1 diag., 1937.

Continuing his studies on crown gall of plants (*Pseudomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xvi, p. 302], the writer describes and tabulates the results of two years' experiments on tomatoes to determine whether oestrogenic substances of animal origin exert analogous effects on plants to those following the introduction of these elements into the human or animal body.

In 1934 plants of seven varieties (including Bonny Best and Ailsa

Craig) were grown in pots in the greenhouse, and two plants of each sort (a) treated with T.S. hormone solution (at first incorporated with the soil and later diluted with double its volume of water and applied at the rate of 30 c.c. per plant), at the rate of 1,000 mouse units (10 c.c.) weekly for nine weeks, (b) as in (a) supplemented by inoculation with the dahlia strain of *Bact. tumefaciens*, (c) inoculated with the latter only, and (d) left untreated for control purposes. On an average, the hormone-treated, uninoculated plants were slightly taller and larger than those receiving both treatments. Tumour formation was somewhat more conspicuous and the fruits generally heavier in the plants to which hormone was applied than in the controls.

In 1935 the experiment was carried out in the open on Lucullus plants receiving 500 mouse units of hormone diluted to 50 c.c. by admixture with 2 per cent. hakaphos for the first three weeks, 1,000 for the second three, and 1,500 for the last three, with and without supplementary inoculation with the dahlia or *Chrysanthemum frutescens* II b strain of *Bact. tumefaciens*. As in the case of the greenhouse plants, the hormone-treated individuals were taller than the controls, but contrary to the results of the 1934 tests the fruits were lighter and tumour formation slightly arrested. In neither year did the hormone treatment expedite flowering.

HARDY (F.). **Marginal leaf-scorch of Cacao. Its relationship to soil potash deficiency. (With a note on the ecology of Cacao thrips).**—*Rep. Cacao Res., Trin., 1936*, pp. 13–24, 1 col. pl. [frontispiece], 1937.

Cacao in Trinidad, Tobago, and Grenada is widely affected by a crenulate, marginal leaf scorch, which appears near the apices of the mature leaves and spreads inwards towards the midrib and backwards towards the petiole along the margin. The affected parts become purplish-grey-brown, membranous, and brittle. The inner borders of the dead areas are lined with darker, purplish-brown pigment, and small, darker brown patches appear within them. Affected leaves fall prematurely, but as young leaves are not affected, the condition becomes most conspicuous towards the end of the wet season.

Sand culture tests, soil and manurial investigations, and chemical analyses of leaf material [which are fully described, and the results tabulated] indicated that the condition is due principally to a deficiency of available potash, or to some disturbance of the nutritional balance, particularly with regard to intake of potassium, calcium, and nitrogen. An unsatisfactory soil structure and atmospheric exposure are contributing factors. The limiting values of available potash for soils of different textures supporting healthy cacao free from leaf scorch were ascertained provisionally to range from 100 to 175 p.p.m. exchangeable potash. The chief analytical features differentiating susceptible from non-susceptible cacao leaves were a high nitrogen-potash ratio, a low potash-lime ratio, a high total ash content, a low soluble ash and total base content, and a low gross nitrogen and potash content.

Control measures recommended consist in suitable manuring, mainly with potash salts, and the improvement of soil structure by the judicious encouragement of natural herbaceous weed growth.

Sibilia (C.). **Ricerche sulle ruggini dei cereali. VII. Lo svernamento di Puccinia graminis tritici Erikss. et Henn. e di Puccinia triticina Erikss. in Italia.** [Researches on cereal rusts. VII. The overwintering of *Puccinia graminis tritici* Erikss. & Henn. and *P. triticina* Erikss. in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 147–164, 1 fig., 1937.

Continuing his studies on cereal rusts [*R.A.M.*, xvi, p. 89] the author, in December, 1936, after a succession of nights when the temperature had dropped to −7° C., found self-sown wheat at Rieti bearing *Puccinia graminis* pustules with germinable uredospores. At the same time, he found in another field numerous pustules of both *P. graminis* and *P. triticina* on volunteer wheat, and on wheat sown early in October, but none on plants sown between the end of October and early November. Mentana wheat sown early in October showed *P. graminis* pustules with uredospores injured by the cold, Rezza wheat sown at the same period showed withered pustules of *P. graminis*, a hard wheat (284/1926) showed pustules produced by the same fungus, and a soft one (539/1932) showed open uredosori of *P. triticina* in excellent condition with well-developed teleutospores.

On 7th February, 1937, volunteer wheat at Salerno showed numerous *P. graminis* pustules, though on 25th February they were not found on cultivated wheat in the same locality. In 1933, 1935, and 1936 pustules of both rusts were found on wheat (sown between November and February) when the temperature was below freezing and snow was prevalent.

Uredospores collected during the winter of 1936–7 from apparently rusted wild Graminaceous plants were sown on the Michigan Bronze and Strube's Dickkopf wheat varieties, the former being susceptible to *P. triticina* and the latter to *P. graminis*. Infection by *P. triticina* was produced on Michigan Bronze by material collected at Alessandria on 12th December, and identified as physiologic race LVII [ibid., xv, p. 83]. Other pustules of both fungi were produced on both wheats by material collected at Salerno on 25th February, 1937. Uredospores collected on 23rd February, 1937, from a wild Graminaceous host in an experimental field near Rome yielded on Michigan Bronze wheat three or four small *P. triticina* pustules, and in 120 similar tests with material from this field four positive infections were obtained. Thousands of apparently healthy wheat seedlings collected from different localities during winter and kept in a glasshouse at 20° for about 20 days failed to develop uredosori, indicating that under Italian conditions the mycelium of either rust does not overwinter in the tissues of plants showing no symptoms of infection.

It is concluded that *P. graminis* and *P. tritici* occur rather frequently in northern and central Italy in the uredo stage on self-sown and early sown wheat, and less commonly on wheat sown at the usual time. The overwintering of these rusts on wild Graminaceous hosts is of importance throughout Italy in view of the fact that slightly over 3 per cent. of infection tests with material collected from such hosts in winter gave positive results. Masked autumn infections on wheat sown on the usual dates either do not occur, or, if they do, produce uredosori during the course of the winter.

Wickens (G. M.). **Smut disease of Wheat in Southern Rhodesia.**—*Rhod. agric. J.*, xxxiv, 4, pp. 271–276, 1937.

The quality of the flour milled from Rhodesian wheat in 1936 is reported to have been much impaired by 'smut', and in future considerably lower prices will be paid for affected samples. As loose smut [*Ustilago tritici*], while it reduces yield, is unlikely to affect flour quality, it is assumed that bunt [*Tilletia caries* and *T. foetens*] was responsible [*R.A.M.*, xv, p. 208; xvi, p. 28; cf. also xvi, pp. 239, 374]. Control of the latter disease is recommended by seed dusting in a machine with copper carbonate, agrosan G, or new ceresan; with regard to loose smut, it is pointed out that much of the wheat in Rhodesia flowers at a period when atmospheric humidity is low, a condition unfavourable to infection of the flowers. Where irrigation is practised, water should be withheld as much as possible during flowering, and if infection should be present to any appreciable degree at this stage the seed taken from the crop should be subjected to the hot-water treatment or discarded, other seed being obtained from a clean crop.

Sandu-Ville (C.). **Tratarea seminței de Grâu contra mălurei.** [Wheat seed treatment against bunt.]—*Anal. Inst. Cerc. agron. Român.*, viii, pp. 501–518, 1936. [French summary. Received July, 1937.]

In seed treatments of wheat against bunt (*Tilletia tritici* [*T. caries*] and *T. foetens*) carried out in Rumania from 1931 to 1936, inclusive, the best results were given by wet treatments with Schloesing's mixture, formalin, germisan, higosan [*R.A.M.*, xiv, p. 499], a preparation made by Professor Nițescu in Rumania, copper sulphate, and uspulun universal. Dust applications were less efficacious, especially in dry autumns, though ceresan reduced infection to some extent. When one and the same preparation can be used either as a dust or a fluid it is more fungicidal in the latter form—synaf, for example, when used as a 1 per cent. solution, giving only 6·7 per cent. bunted ears, as against 54·1 per cent. when used as a dust. It was also found that plots watered in autumn gave a lower percentage of bunt than unwatered plots. No infection whatever developed in plots sown with seed treated with uspulun universal, higosan, germisan, or formol solutions.

Grodsinsky (L.). **Manifestación foliar del Ustilago tritici.** [Foliar symptoms of *Ustilago tritici*.]—*Rev. argent. Agron.*, iv, 1, pp. 71–72, 1937.

A wheat plant occurring in the $F_1$ of Kooperatorka×38 M.A. was found with smut sori on both surfaces of the superior leaf blade, causing it to rupture longitudinally. The spike enclosed by the sheath was also attacked by the smut, which was identified on the basis of the size of the chlamydospores and the germination and growth in culture as *Ustilago tritici* [*R.A.M.*, xv, p. 84], not hitherto reported in this form from the Argentine.

Hanna (W. F.). **Physiologic forms of loose smut of Wheat.**—*Canad. J. Res.*, Sect. C, xv, 4, pp. 141–153, 1937.

In this account of continued investigations on loose smut (*Ustilago tritici*) of wheat in Manitoba [*R.A.M.*, xi, p. 443], the author states that

in the course of greenhouse inoculations with the two races of the smut previously differentiated two additional races appeared. Spores from light infections on certain varieties inoculated with the original loose smut collections were used to inoculate the variety from which they had come, and the spores thus produced were tested on 13 varieties of wheat. In this manner the two new races were obtained. One, which gave 87 per cent. infection on Renfrew, while the first inoculation had only produced 4 per cent. infection on this variety, differed from the two original races in its reaction on the Ceres and Preston wheats; the other differed from the second original form in its reaction on Pentad, Mindum, and Khapli. The former race probably originated as an impurity in the parent collection on the Reward variety, the latter as a mutation from the parent strain, as it does not attack Reward, from which the original collection was made. The inoculation of Reward, Garnet, Marquis, and Pentad × Marquis with their own spores to four generations, did not result in increased infection by loose smut on these varieties, the first three of which were susceptible and the last moderately resistant. A physiologic race to which Pentad × Marquis was susceptible would probably have been purified and increased by such procedure. Still further experiments with Reward wheat, healthy plants of which are sometimes found in populations grown from artificially infected seed, showed that repeated selection through several generations from these healthy plants did not increase their resistance to loose smut, and their presence signifies accidental escape from infection rather than inherent resistance.

WESTERN (J. H.). **Sexual fusion in Ustilago avenae under natural conditions.**—*Phytopathology*, xxvii, 4, pp. 547–553, 1 pl., 1937.

In the course of studies on sporidial production by *Ustilago avenae* in nature, oat grains enclosed in their glumes were inoculated by means of Allison's vacuum pump (*Tech. Bull. Minn. agric. Exp. Sta.* 119, 1936) with suspensions of (*a*) chlamydospores and (*b*) mixtures of two sporidial lines of different sexes in distilled water, 2 per cent. malt solution, and 2 per cent. potato dextrose solution. After several hours' drying the grains were placed on moist filter paper in Petri dishes and left to germinate at temperatures of 0°, 5°, 10°, 20°, 25°, and 30° C. For subsequent examination the material was mostly stained with lactophenol and cotton blue, but Bismarck brown, gentian violet, and Gram's iodine were also used in particular instances. Besides the mature grains treated as described above, some oat florets were dusted with chlamydospores while still on the plant.

The smut spores were found to germinate and the promycelia to grow almost as rapidly in distilled water as in nutrient solutions. At 0° germination was almost entirely inhibited, at 5° and 10° germination took place without sporidial production but accompanied by the formation of looped fusion tubes uniting contiguous mycelial segments, while at 20° and 25° there were a few sporidia, gemmae, and numerous fusion tubes closely resembling the fused sporidia of artificial cultures and frequently giving rise to true infection hyphae. The inoculation of two monosporidial lines of unlike sex between the oat glumes resulted at 25° in the development of fusions indistinguishable from those occurring

in culture, and the initial penetration of the host was shown to be accomplished by means of infection tubes piercing the epidermal wall in an exactly similar manner to those arising from chlamydospores [*R.A.M.*, xv, p. 711]. At 30° no sporidia were formed, germination was reduced, promycelial contortion was common, and fusions were not apparent.

The course of flower infection was observed on the susceptible Anthony variety. Spore germination was found to commence about twelve hours after dusting the young stigmas, normal promycelia developed, and a few sporidia were formed, followed shortly by fusions between adjoining mycelial segments and occasionally by the apparent inception of a multiseptate mycelium. Stigma penetration was invariably effected by direct entry of the promycelium.

Discussing the bearing of these data on physiologic specialization in *U. avenae*, the writer suggests that the observed constancy of certain races of the smut may be explained by the predominance in nature of the restricted types of sexual fusion here described [cf. ibid., xvi, p. 446].

GERRETSEN (F. C.). **Manganese deficiency of Oats and its relation to soil bacteria.**—*Ann. Bot., Lond.*, N.S., i, 2, pp. 207–230, 4 pl., 1937.

This is a full account of the author's investigations into the relationships between manganese deficiency, soil bacteria, and grey speck of oats, other versions of which have already been noticed from different sources [*R.A.M.*, xvi, p. 92].

HEDLUND (T.). **Om Havrens gråfläcksjuka som en av orsakerna till ohälsosamt hö.** [On the grey speck disease of Oats as one of the causes of unwholesome hay.]—*Landtmannen, Uppsala*, xxi, 16, pp. 375–376, 1 fig., 1937.

Grey speck of oats [see preceding abstract], timothy [*Phleum pratense*], and other fodder grasses, is among the diseases adversely affecting the quality of the hay produced by the crop, the unwholesomeness of which is reflected in its ill effects on domestic animals. The chemical metabolism of the disease is discussed in relation to E. Hiltner's studies in Germany [*R.A.M.*, iv, p. 275] and to a concurrent series of experiments at Alnarp, Sweden. The primary cause of the whole trouble lies in the shortage of sugar in the leaves, the first symptom of which (developing long before the characteristic foliar spotting) is a marked lowering of resistance to frost. A necessary concomitant of the lack of sugar is deficiency of the acids forming the bases of sodium and potash salts.

SPRAGUE (R.). **Fusarium poae on spring Oats in Oregon.**—*Plant Dis. Reptr*, xxi, 5, pp. 87–88, 1937. [Mimeographed.]

*Fusarium poae* [*R.A.M.*, xiv, p. 720] has been observed on the panicles of spring oats in Oregon, causing a buff discoloration and sterility of the affected organs. In some cases the fungus appears to be a secondary parasite on spikelets, already rendered sterile by smut (*Ustilago levis*), 5 per cent. of which was observed at the John Jacob Astor Experiment Station on a variety reputed to be Markton [ibid.,

xvi, p. 309]. Cultures of *F. poae* produce tufted, buff-coloured colonies on potato dextrose agar, with abundant production of *Sporotrichum* like conidia [ibid., xi, p. 647] at 35° to 40° C.

STEVENS (N. E.). **Third experimental forecast of the incidence of bacterial wilt of Corn.**—*Plant Dis. Reptr*, xxi, 6, pp. 102–107, 1 graph, 1 map, 1937. [Mimeographed.]

The successful development by plant breeders of maize varieties combining excellent quality with a satisfactory degree of resistance to bacterial wilt [*Aplanobacter stewarti*: *R.A.M.*, xvi, p. 449], has seriously handicapped the writer's studies on the relation of winter temperatures to outbreaks of the disease in the following season [ibid., xv, p. 573]. However, data are forthcoming to show that, as was to be expected from the relatively low (92) winter index for Washington, D.C., in 1935–6, the losses from maize wilt in that area were decidedly reduced in the following summer for the first time in recent years. Reports from other districts tend to bear out the hypothesis of a relationship between a comparatively severe winter and a decline in the severity of *A. stewarti*. On the basis of the high winter temperature indices for 1936–7 on the eastern seaboard, there should be a noticeable increase of bacterial wilt on susceptible maize varieties in the area between northern Virginia and southern Connecticut early in the growing season of 1937.

PEGLION (V.). **Presenza della Nematospora coryli nel Granturco cimiciato.** [The presence of *Nematospora coryli* in insect-infected Maize.]—Reprinted from *Mem. R. Accad. Bologna*, Ser. IX, ii, (*1934–35*), 5 pp., 1935. [Received July, 1937.]

Maize seed in Italy that appeared to have deteriorated in the ear as a result of insect infestation and that after a few days in the laboratory developed a copious growth of *Oospora verticillioides* (? *Gibberella moniliformis*) [*R.A.M.*, xii, p. 505] constantly showed the presence of *Nematospora coryli* within the tissues [ibid., xv, p. 719]. The asci were least common in the aleurone layer, but abundantly present in the embryo, which contained up to 30 per cent. fat as against up to 4·5 per cent. in dry maize ears.

TAKASUGI (H.) & AKAISHI (Y.). **Studies on the smuts of Sorghums. (Second report.) Germination and infection power of the loose kernel smut (Sphacelotheca cruenta (Kühn) Potter) of Sorghum and its prevention.**—*Res. Bull. S. Manchuria Rly Co.* 16, pp. 49–75, 1937. [Japanese, with English summary.]

In a test to determine the infective capacity of *Sphacelotheca cruenta* [*R.A.M.*, xvi, p. 377 and next abstract] spores in soil at varying distances from sorghum seeds, no smut developed beyond 7·5 cm. when both were on the same level, while the corresponding limits when the seeds were below or above the spores were 12·5 and 10·5 cm., respectively. In a dry state the spores retained their viability for four years. The maximum germinative and infective capacity was shown by spores overwintered in a moist chamber in which a uniformly high temperature

was maintained day and night, whereas those laid on the surface of the soil, either directly or in smutted sorghum ears with various kinds of protective coverings, completely lost their viability. *S. cruenta* spores require about 18 days to mature after the emergence of the diseased ear from the sheath, and maintain 35 per cent. of their infective capacity until the following year. Eight of the 68 sorghum varieties of which the seed was inoculated before sowing with *S. cruenta* spores showed a fair degree of resistance.

The incidence of loose kernel smut was found to be promoted by the heavy piling-up of soil over the seed, and by a deficiency of potassium and phosphoric acid in the fertilizer. Infection may be arrested by the prompt removal of diseased ears. The most effective of the various methods of seed treatment tested was sprinkling with a dilute solution of formalin.

Marcy (D. Elizabeth). **Inheritance of resistance to the loose and covered kernel smuts of Sorghum. I. Dwarf Yellow Milo hybrids.** —*Bull. Torrey bot. Cl.*, lxiv, 4, pp. 209–228, 2 pl., 2 graphs, 1937.

This is a full report of the author's studies [a reference to which has already been noticed from another source: *R.A.M.*, xv, p. 642] of the inheritance in sorghum of resistance to *Sphacelotheca sorghi* and *S. cruenta*, this issue dealing with hybrids between the two resistant varieties Dwarf Yellow Milo and Feterita, and between the first-named and the susceptible varieties Dakota Amber Sorgo, Shallu, and Dawn Kafir, and their reciprocals. Inoculation experiments [by a method which is briefly described] with the two resistant varieties showed that when germinated under environmental conditions favouring heavy infection of susceptible varieties, Feterita may also become infected with *S. sorghi*, but not Milo, indicating that the two varieties differ genetically from one another; there was no reason to believe that the infection of Feterita was due to a different physiological race of the smut. No difference, however, was observed between the two varieties in respect of *S. cruenta*. The four susceptible varieties represented widely different types of sorghum, also differing in their degree of susceptibility. Their reaction to the two smuts corresponded closely, a variety giving high infections with one smut tending to give high infections with the other, though percentage infection with *S. cruenta* was always lower. There was evidence that in the hybrids between Dwarf Yellow Milo and the susceptible varieties resistance to *S. sorghi* may be governed by a single factor, and reaction to *S. cruenta* by more than one.

**Annual Report of the Veterinary and Agricultural Department, British Somaliland, for 1936.**—20 pp., 1 graph, [1937. Mimeographed.]

In 1936 sorghum in British Somaliland was affected by *Tolyposporium filiferum* [*T. ehrenbergii*: *R.A.M.*, xv, p. 829], *Sphacelotheca sorghi* [ibid., xvi, p. 377], which in some cases produced 100 per cent. infection in the second crop, *S. cruenta* [see preceding abstract], *Sorosporium reilianum* [ibid., xvi, p. 377], and *Cladosporium herbarum*. Copper sulphate was issued free for control purposes.

Arruda (S. C.). **Myriogenospora aciculisporae Vizioli sobre Milho.** [*Myriogenospora aciculisporae* Vizioli on Millet.]—*Biologico*, iii, 2, pp. 75–76, 1 fig., 1937.

A very brief account is given of a diseased condition of an unspecified millet in the Botanic Garden of Cantareira, São Paulo, caused by a fungus which is referred to *Myriogenospora aciculisporae* [*R.A.M.*, xiii, p. 706], in spite of the fact that the maximum length of its spores was found to be 34 instead of 25 $\mu$, as indicated in Vizioli's diagnosis.

Gonçalvez (R. D.). **Cerebella andropogonis Cesati parasitando Claviceps sp. sobre varias Gramineas.** [*Cerebella andropogonis* Cesati parasitizing *Claviceps* sp. on various Graminaceous plants.]—*Biologico*, iii, 2, pp. 74–75, 1937.

The fact that *Cerebella andropogonis* [*R.A.M.*, xi, p. 544] was found inside inflorescences of three grasses (*Hyparrhenia rufa*, *Tricholaena rosea*, and *Panicum barbinode*) from various localities in the States of Rio de Janeiro, São Paulo, and Minas Geraes, its mycelium surrounding compact masses of small, unicellular spores, resembling those of the *Sphacelia* stage of a species of *Claviceps*, induces the author to believe that it was actually parasitizing the last-named organism, and not the higher plant host. In support of this view he refers to several records of *Cerebella* species parasitic on ergot-producing fungi [ibid., viii, p. 34].

Wardlaw (C. W.) & Leonard (E. R.). **Antiseptic and other treatments in the storage of Trinidad Citrus fruits.**—*Mem. Low Temp. Res. Sta., Trin.*, 5, pp. 3–23, 13 graphs, 1937.

Further investigations into the storage of Trinidad grapefruit [*R.A.M.*, xv, p. 495 and next abstract] showed that the fungi mainly responsible for wastage are (in descending order of importance) *Botryodiplodia theobromae*, *Colletotrichum gloeosporioides*, and *Penicillium digitatum*.

Grapefruit immersed for 20 seconds in 8 per cent. boric acid solution at 100° F., after 40 days' storage at 76° showed 87·5 per cent. wastage due to *B. theobromae* and *C. gloeosporioides* as against 12 per cent. in the undipped controls. Other grapefruit scrubbed with a spore suspension of *P. digitatum* and similarly dipped and stored showed 94 per cent. total wastage (all three organisms) as compared with only 10 per cent. wastage in the controls. When grapefruit after being submitted to different quailing periods were dipped in 7 per cent. boric acid solution at 100° for about 15 seconds and stored at (*a*) 45° for 66 days, and (*b*) 45° for 20 days, followed by 60° for 12 days, minimum wastage (7·8 and 0 per cent., respectively, for long and short storage) occurred in the undipped controls given 24 hours' quailing, whereas the dipped fruit even after short storage showed upwards of 28 per cent. wastage. Similar results were also obtained in other experiments. Treatment in water at 100° for 20 seconds, however, did not increase wastage, and in fruit stored at 45° immediately after dipping and later held at 60°, the injurious effects of the borax were masked or delayed. The author concludes that the borax dip for Trinidad grapefruit should be discontinued.

Waxing of grapefruit was definitely beneficial in reducing loss of weight during storage and decreasing the rate of blemishing and fungal wastage.

Grapefruit placed in iodized wraps prepared according to Tomkins's formula [ibid., xv, p. 702; xvi, p. 311 and below, p. 621] and applied approximately three days after picking, after 15 days' storage at 80° showed 32 per cent. wastage due to *B. theobromae*, as against only 5 per cent. wastage in the fruits in untreated wraps; by the 39th day both lots showed approximately equal amounts of wastage, the iodine promoting infection by *B. theobromae*, and failing to control *C. gloeosporioides*. When oranges were placed in plain and iodized wrappers (*a*) within 24 hours of picking, and (*b*) after 4 days' storage at tropical temperatures, 20 days at 45°, and 1 day at 60°, in lot (*a*) the iodized wraps controlled wastage by *B. theobromae* and *C. gloeosporioides*, whereas in lot (*b*) they promoted wastage. When oranges were scrubbed with a suspension of *P. digitatum*, wrapped in plain or iodized wrappers, and held at 78° and 60°, definite control of *P. digitatum* resulted at both temperatures, especially at the higher one, but the fruit in the iodized wraps developed a high percentage of infection by *B. theobromae*. It would appear that when infection is still superficial iodine vapour curtails spore germination and hyphal growth, but when the interval between picking and wrapping allows hyphal penetration, or where latent infections are present, it lowers resistance to fungal attack.

In an appendix entitled 'Mycological Notes on Citrus Wastage' (pp. 24–27) by R. E. D. Baker [ibid., xvi, p. 395] the author states that inoculations of Marsh grapefruit, Valencia oranges, lemons, T1 limes, *Citrus aurantifolia*, Kusai limes, and Rangpur limes, through wounds showed *P. digitatum* to be a vigorous fruit-rotting organism, and *P. italicum* a weak parasite or saprophyte. Observations in the field and packing shed, and in cold storage confirmed this result. *B. theobromae* was shown experimentally to enter grapefruit through the button at or shortly after picking time.

Leonard (E. R.) & Wardlaw (C. W.). **Storage investigations with Trinidad Citrus fruits, 1935–36.**—*Mem. Low Temp. Res. Sta., Trin.*, 6, 28 pp., 8 graphs, 1937.

Further investigations into the storage behaviour of Trinidad grapefruit [see preceding abstract] showed that during the dry season quailing can be safely eliminated. The fruit should not be picked while wet with rain or dew if oleocellosis [ibid., xvi, p. 300] is to be avoided. The evidence indicated that for prolonged storage a temperature over 45° F. may be desirable; early cold storage with rapid cooling is advisable to check fungal growth and reduce loss in turgor. Grapefruit from different parts of Trinidad showed marked contrasts in the amount of fungal wastage that developed in storage, indicating that sanitation is probably faulty in some orchards.

In preliminary respirational studies it was found that grapefruit normally possesses a low internal concentration of carbon dioxide, and that wastage may be increased by exposure to relatively low carbon dioxide concentrations.

[A summarized account of these investigations and those described

in the preceding abstract appears in *Trop. Agriculture, Trin.*, xiv, 4, pp. 95–96, 1937.]

Doidge (E[thel] M.) & van der Plank (J. E.). **The fungi which cause rots of stored Citrus fruits in South Africa.**—*Sci. Bull. Dep. Agric. S. Afr.* 162, 23 pp., 1936. [Received July, 1937.]

A special survey [the results of which are tabulated] of the fungi occurring on stored citrus fruits in South Africa, carried out under high temperature and long storage conditions in order to favour the development of all pathogens present, showed that the only important fungi commonly found on oranges and lemons were *Penicillium digitatum* and *P. italicum* [*R.A.M.*, xv, pp. 497, 716; xvi, p. 529 and next abstract]. The former is the most important rotting organism in South Africa, Navel oranges being highly susceptible to it, though Valencias are usually resistant. *P. italicum* is generally unimportant, but occurs to a small extent in most consignments; it causes severe rotting occasionally, and in one instance was observed to enter through oleocellosis spots [ibid., xvi, p. 94]. Except for these two, the more vigorous pathogens were generally scarce, the only other organisms widely prevalent being *Alternaria citri* [ibid., xv, p. 716] and *Colletotrichum gloeosporioides* [loc. cit.], both of which produce a slow decay unlikely to become serious under normal conditions of storage and marketing. *A. citri* is possibly the commonest cause of decay in Valencia oranges [cf. ibid., viii, p. 237].

Other records on oranges included *Diplodia natalensis* (generally unimportant), *Fusarium angustum* [ibid., xii, p. 486], *F. lateritium* [ibid., xv, p. 495], *F. oxysporum*, *F. sambucinum* [ibid., xvi, p. 560], *F. sambucinum* f. 2, *F. scirpi*, *F. scirpi* var. *compactum*, *F. semitectum* var. *majus*, *F. solani* [ibid., xv, p. 764], *F. stilboides*, *F. vasinfectum*, *Oospora citri-aurantii* (uncommon in South Africa) [ibid., xiv, p. 428], *Phoma citricarpa* [ibid., xvi, p. 247], *Phomopsis* [*Diaporthe*] *citri* (not causing extensive damage), and *Trichoderma lignorum*.

Putterill (V. A.) & Dreyer (D. J.). **Citrus wastage investigations. Progress Report No. 4. Season 1935.**—*Bull. Dep. Agric. S. Afr.* 169, 24 pp., 1936. [Received June, 1937.]

A fully tabulated account is given of packing tests during the 1935 season in the Transvaal and Eastern Cape Province, which showed that in the Transvaal mould [*Penicillium digitatum* and *P. italicum*: *R.A.M.*, xv, p. 363 and preceding abstract] wastage was reduced from one mouldy fruit per four lug-boxes in the preceding season to one in 52 boxes at grader intake. This improvement is attributed to the curtailment of the 48-hour wilting period which, while being a distinct advance on previous practice, still allowed too much scope for the possible effects of any of the unforeseen delays that are apt to occur during the harvesting operations. The first packhouse consignment developed after 21 days' cold storage a degree of waste of the same order as the shorter wilted fruit of the wilting tests, whereas the comparable consignment of 1934 was very much more wasty, the difference being ascribed almost entirely to the improved conditions in the packhouse in respect of mould infection. Washing the harvested fruit with 8 per

cent. borax solution both in the grove and four days later in the packhouse, or with 8 per cent. metaborate in the packhouse only, reduced the mould wastage, as established by examination 7, 14, and 21 days after arrival in England, to a general average of 1 per cent., as against a mean percentage of 2, 6, and 3, respectively, found on the same dates in the controls. Washing with 1 per cent. caustic soda in the groves alone gave a mean percentage of wastage of 1, 2, and 4, respectively. In tests with oranges artificially inoculated by handling them gently with spore-contaminated gloves, the tightly packed boxes developed one and a half times more waste than the looser packed boxes; wilting the fruit somewhat reduced the wastage.

At the Grahamstown packhouse the number of wasty oranges worked out at 1 fruit in 20 lug-boxes, as compared to 1 in 16 in 1934. Great attention was paid to keeping down the mould spore contamination in the packhouse by regularly spraying with formalin all the parts of the plant and conveyances with which the fruit comes into contact, a precaution which is felt to have helped to reduce mould wastage. Dipping the oranges for 3 minutes in an 8 per cent. metaborate solution at 75° F. appeared to retard mould development during the first three weeks after discharge in England, but the waste by the fourth examination was practically identical with that in the control. Tight, as against loose, packing of artificially inoculated fruits in boxes had an effect on mould development very similar to that in the Transvaal.

Haas (A. R. C.). **Boron deficiency effects similar in general appearance to bark symptoms of psorosis in Citrus.**—*Soil Sci.*, xliii, 4, pp. 317–325, 2 pl., 1937.

When boron was alternately omitted from the culture solution (containing 0·1 p.p.m. of manganese and of iron as tartrate) in which Valencia orange cuttings were growing and supplied at the rate of 1 p.p.m., the following symptoms were observed during one of the recovery periods: new growth in certain shoots and complete defoliation in others, corky ridges in the bark, a smooth callused area covering much of the surface of the main branch, a callused bark wound on the upper portion of the trunk, and the sloughing of the bark accompanied by callus formation underneath on the lower part. The absence of boron from the nutrient solutions of budded orange trees (6 ft. or more in height) in 12 gall. earthenware jars resulted in longitudinal splitting of the bark of the trunk and large branches, the wounds in some cases being 3 in. or more in length. Active callusing took place within five days of the addition of 5 p.p.m. boron to the solution. In orange trees in sand cultures the omission of boron further led to the development of numerous scales, resembling those associated with psorosis [*R.A.M.*, xvi, p. 451 and next abstracts] on the outer bark layers.

Analysis of dry bark samples of healthy and psorosis-diseased Washington Navel orange trees suggests a connexion between the boron content of the soil and the infectious principle of psorosis. As far as they go the data obtained indicate a higher boron and pectin content and a lower proportion of calcium in healthy than in diseased trees. Psorosis is known to occur, however, in districts where citrus cultivation is complicated by the excessive boron content of the soil [ibid., xi,

p. 570], so that no etiological connexion can at present be established between the deficiency of this element and the disease.

FAWCETT (H. S.). **Novos rumos no combate á psorose dos Citrus.** [New methods for the control of psorosis of Citrus.]—*Biologico*, iii, 3, pp. 81–84, 2 pl., 1937.

In view of the recent confirmation of the existence of psorosis of citrus trees in Brazil [see preceding and next abstracts], the author gives a brief account of the measures which have been newly adopted in California for its control. In their main lines they consist in the careful selection of the sweet orange, pomelo, and tangerine trees from which the grafts are taken, any individual showing the slightest symptom of psorosis [a brief morphological description of which is included] in its bark or leaves being strictly rejected. The trees selected should be preferably at least 20 years old and in no case under 10, excepting where the mother-tree is itself a graft taken from another tree known to be healthy. All the cuttings taken from one mother-tree should be used to graft stocks in one block in the nursery, so that should any one of the grafts exhibit psorosis symptoms during the first year of growth, the whole lot may be destroyed without loss of time. Lemons and limes may be symptomless carriers of the disease, and are generally much more resistant to it than the other citrus species; when grafted on sweet orange stocks, the latter should be free from psorosis. Before a lemon or lime tree is accepted as a mother-tree for grafts, its health should be tested either by grafting a sweet orange bud on it or by first making a few experimental grafts from it on sweet orange.

FAWCETT (H. S.), GRILLO (H. V. S.), BITANCOURT (A. A.), & MÜLLER (A. S.). **Relatorio sobre as doenças dos Citrus no Districto Federal, Estado do Rio de Janeiro e Minas Geraes.** [Report on Citrus diseases in the Federal District, State of Rio de Janeiro, and Minas Geraes.]—*Rodriguésia*, ii, 7, pp. 329–344, 1936. [Received June, 1937.]

This report, issued on the conclusion of Fawcett's visit to Brazil at the end of 1936, is divided into two principal parts, the first of which, signed by the three first-named authors, deals with the diseases of citrus trees in the Federal District and the State of Rio de Janeiro, where the most important troubles are stated to be melanosis and stem-end rot (*Phomopsis* [*Diaporthe*] *citri*) [see next abstract], foot rot (*Phytophthora parasitica*), sweet orange scab (*Elsinoe australis*) [*R.A.M.*, xvi, p. 451], sour orange scab (*E. fawcetti*) [ibid., xvi, p. 452], psorosis [see preceding abstracts], and zonate chlorosis [ibid., xv, p. 13]. It also contains recommendations for the control of these diseases, chiefly based on the results of recent work done either locally or in the United States. A briefly annotated list is also given of minor diseases of citrus species, and it is stated that in all the districts visited the environmental conditions appear to be favourable for the development of entomogenous fungi attacking the citrus coccids [ibid., xv, p. 216]. The second part, signed by Fawcett and Müller, gives an account of the investigations carried out in the State of Minas Geraes, where the major citrus

diseases are foot rot, psorosis, sour orange scab, and melanosis. In the Bello Horizonte region the death was observed of citrus shoots [species not indicated], 10 to 12 cm. long, in association with a growth of *Penicillium digitatum* on their surface. The authors confirm J. Deslandes's record of a new disease in the district of Lavras, characterized by the development of large chlorotic spots on the leaves, and believed to be due to a virus; the symptoms appear to be intermediate between those of leprosis and zonate chlorosis. It was only observed in self-rooted trees under 20 years of age, at some distance from the city.

Franco (A.) & Ferreira (C.). **A podridão peduncular das Laranjas. Estudo estatistico sobre o emprego do borax e da tesoura.** [Stem-end rot of Oranges. Statistical study on the use of borax and of clippers.]—*Rodriguésia*, ii, 7, pp. 295–300, 1936. [Received June, 1937.]

The authors state that the statistical analysis of the results of a small-scale experiment (on a total of 1,879 mixed oranges) carried out by the Plant Protection Service in Brazil showed that dipping the harvested oranges in a borax solution [concentration not indicated] was alone effective in the control of stem-end rot [*Diaporthe citri*; *R.A.M.*, xv, p. 797; xvi, p. 451], since the difference obtained by the variance method was 25 times the experimental error ($13{\cdot}7 \pm 0{\cdot}54$). No significant difference was found, on the other hand, between cutting the fruit with a specially built pair of clippers and pulling them off by hand.

Benatar (R.). **Sobre uma nova mancha em epicarpo de 'Citrus sinensis' Osbeck causada pelo Phoma puttemansii n.sp.** [On a new spot on the epicarp of *Citrus sinensis* Osbeck, caused by *Phoma puttemansii* n.sp.]—*Rodriguésia*, ii, 7, pp. 306–313, 6 pl., 1936. [Received June, 1937.]

A brief progress report is given of morphological and cultural studies of a species of *Phoma* which in 1912 had been recorded (but not named) by Puttemans as occurring occasionally on orange fruit marketed in Rio de Janeiro, and in 1936 was found causing a spot on sweet oranges (*Citrus sinensis* var. 'Pera') in the State of Rio, Brazil, resulting in losses of about 5 per cent. in shipments from that State. The spots occur exclusively on the lower half of the fruit; at first they are small and dark grey, but gradually they extend to occupy up to one-third of the surface, and become carbonaceous-black; they also extend in depth and finally penetrate and rot the pulp. The fungus grows well on potato agar and potato slices, on which it produces a septate and torulose mycelium, at first white but later olivaceous-black. The pycnidia, mostly immersed in the ectocarp (rarely in the mesocarp) are subglobose or ellipsoidal, black, and 90 to 210 by 50 to 100 $\mu$ in diameter; the spores are ellipsoidal or oblong-ovate, rounded at both ends, and 6 to 13 by 4·5 to 7 $\mu$. The fungus is considered to be new to science and is named *P. puttemansii* [with a Latin diagnosis]. The rot was reproduced in the laboratory by inoculating superficially scarified oranges with a culture isolated from a rotting fruit, but similar tests on ripening oranges on the trees gave negative results.

Bitancourt (A. A.). **A leprose e a proxima colheita de Laranjas.** [Leprosis and the coming Orange crop.]—*Biologico*, iii, 2, pp. 37–40, 1 fig., 1937.

After stating that recent surveys have shown that leprosis continues to increase in importance in orange groves in the State of São Paulo, especially in the Limeira region [*R.A.M.*, xv, p. 291], the author briefly describes the results of an experiment, in which heavily infected sweet orange trees were pruned bare of all their foliage in 1933 and 1934, and the next season produced a healthy new growth, free from all symptoms of the disease. The health of these trees was maintained without further pruning by spraying them with Bordeaux mixture. In the same groves a very considerable reduction of leprosis was obtained in another set of trees by applications of Bordeaux mixture without pruning, though the amelioration was gradual. He concludes from these findings that leprosis should not be difficult to eradicate, if it were not for the danger of reinfection from outside, due to the practice of the local growers who entrust the harvesting of their citrus crops to professional teams, the latter bringing their own implements, and frequently passing from a diseased grove directly to a healthy one. This danger could be obviated by subjecting all apparatus brought into the groves to disinfection either with formalin or Bordeaux mixture.

Ruggieri (G.). **Ricerche sull' affinità d'innesto del Limone 'Monachello' con altri Citrus.** [Researches on the grafting affinity of the Monachello Lemon with other Citrus varieties.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 79–86, 2 pl., 4 figs., 1937.

Experimental evidence is adduced showing that the Monachello lemon variety, which is resistant to mal secco (*Deuterophoma tracheiphila*) [*R.A.M.*, xvi, p. 527], is better suited for grafting on mandarin orange [*Citrus nobilis*] and sweet orange than on lemon or sour orange [*C. aurantium*]. Italian growers, pending further investigations, are recommended to reconstitute their groves with sweet orange grafted on sour orange and then to regraft Monachello lemon on the sweet orange.

Bouhelier (R.). **Chloroses des Aurantiacées: foliocellosis et maladies de carence.** [Chloroses of the Aurantiaceae: foliocellosis and deficiency diseases.]—[*Rev. maroc.*] *Fruit Primeurs*, vii, 74, pp. 143–146, 1 fig., 1937.

The author gives details of an experiment carried out in Morocco in which, in September, 1935, an orange tree severely affected by mottle leaf [*R.A.M.*, xvi, p. 378] was treated by sprinkling the soil round it with 3 kg. zinc sulphate mixed with 10 kg. iron sulphate, a second severely affected tree receiving a similar application of 3 kg. zinc sulphate mixed with 2·5 kg. potassium sulphate. In May, 1936, the former tree was sprayed with 0·1 kg. zinc oxide and 1 kg. white oil in 100 l. water, and the latter with 1 kg. zinc sulphate per 100 l. and sufficient lime to produce alkalinity. Two slightly affected trees received the spray treatments only. By December, 1936, all four trees showed very marked improvement, and by the following April were practically normal, although during the period of the experiment other

affected trees some distance away grew progressively worse. Of the soil applications, the mixture containing the potassium sulphate appeared to give the better results. Though the sprayed leaves recovered their normal colour, the young shoots that developed later in some cases showed traces of the disease.

Presley (J. T.) & Thom (C.). **'Spore mats' of Phymatotrichum omnivorum.**—*Phytopathology*, xxvii, 4, p. 588, 1937.

Better 'spore mats' of the cotton root rot fungus (*Phymatotrichum omnivorum*) [*R.A.M.*, xvi, p. 454] for investigation in the field at Sacaton, Arizona, were found to be obtainable by protecting them from the sun, wind, and insects. The white, cheesy masses of mycelia were carefully covered as they began to develop, and within a week the supporting cells had broken down and the mat was largely composed of a powdery spore mass enveloped by a loose hyphal membrane and bearing a general resemblance to the closed fruit body of a Gasteromycete or to some obscure accessory structure of an Ascomycete, rather than to the fruit mass of a Hyphomycete.

Arndt (C. H.) & Christie (J. R.). **The comparative rôle of certain nematodes and fungi in the etiology of damping off, or soreshin, of Cotton.**—*Phytopathology*, xxvii, 4, pp. 569–572, 1937.

In controlled experiments conducted in 1935–6 to determine the relative influence of various nematodes and fungi in the etiology of damping-off or sore shin of cotton in South Carolina, *Fusarium moniliforme* [*Gibberella moniliformis*], as previously reported by N[aomi] C. Woodroof [*R.A.M.*, vi, p. 609], tended to reduce germination by 10 to 15 per cent. as compared with the controls, and greatly to increase the number of lesions on the hypocotyls, without, however, causing typical damping-off. The addition of nematodes to the crocks infested with *G. moniliformis* did not significantly augment the incidence and severity of the disease but caused some reduction in the average plant weight. Somewhat inconclusive results were obtained with *Fusarium vasinfectum*, while *Glomerella gossypii* [ibid., xvi, p. 173] caused typical damping-off in all the tests. In the 1935 series only 28 per cent. of the original seedlings (germination 80 per cent. of that of the controls) were alive after nine weeks, and they were mostly small and diseased. Neither with *F. vasinfectum* nor *G. gossypii* was there any appreciable increase in the severity of seedling injury as a result of the addition of nematodes to the cultures.

Bitancourt (A. A.). **O carimã ou anthracnose das maçãs de Algodoeiro.** [The 'carimã' or anthracnose of Cotton bolls.]—*Biologico*, iii, 3, pp. 101–102, 1937.

Anthracnose of cotton bolls is stated to be very prevalent in the cotton plantations of São Paulo, where it is commonly attributed to the agency of a fungus [? *Glomerella gossypii*]; the etiology of the disease, however, is complicated by the fact that very frequently the typical anthracnose spots, dark wine-red and depressed, are mixed with bacterial spots which, in early stages of development, only differ from the healthy tissue in their oily appearance and slightly darker colour.

Often, too, the bacterial spots may develop in very young bolls, free from typical anthracnose lesions, leaving open the question of which of the two organisms is the primary pathogen. In the West Indies the bacterium [*Bacterium malvacearum*] is held to be the responsible agency, and this view is supported by S. C. Harland, who bases his opinion on the fact that some new cotton varieties, recently introduced by him into the State of São Paulo, exhibit a high degree of resistance to the bacterium, and have so far remained immune from anthracnose lesions.

GRILLO (H. V. S.). **Relatorio sobre a murcha do Algodoeiro, causada pelo 'Fusarium vasinfectum' Atk. no Estado da Parahyba.** [Report on the wilt of Cotton, caused by *Fusarium vasinfectum* Atk. in the State of Parahyba.]—*Rodriguésia*, ii, 7, pp. 319–327, 6 pl., 1936. [Received June, 1937.]

In this report to the Director of the Institute for Plant Biology in Rio de Janeiro, at whose request he visited the State of Parahyba in April, 1936, the author states that his personal investigations, supported by the study of material collected by him or sent in to him later, definitely established the presence in that State of cotton wilt (*Fusarium vasinfectum*) [*R.A.M.*, xvi, p. 380]. The infected areas appear to be few and limited, and recommendations are made with a view to preventing further spread of wilt, such as the total destruction of all cotton plants and other hosts infected with *F. vasinfectum*, quarantine restrictions of exports from the State, prohibition of the movement of animals from the infected areas and obligatory disinfection of the clothing of persons working in diseased fields and of their implements, and finally, the use for planting of resistant varieties.

GEITLER (L.). **Über einen Pilzparasiten auf Amoeba proteus und über die polare Organisation des Amöbenkörpers.** [On a fungal parasite of *Amoeba proteus* and on the polar organization of the amoebal body.]—*Biol. Zbl.*, lvii, 3–4, pp. 166–175, 3 figs., 1937.

Details are given of the infestation of about 95 per cent. of some 400 individuals of *Amoeba proteus* at the Lunz (Austria) Biological Station by a fungus with fasciculate, non-septate hyphae, up to 100 (rarely 200) by 3 to 4 $\mu$, arising from a vesicular haustorium situated in the entoplasm of the host; intercalary, seldom terminal, subspherical resting cells, up to 12 $\mu$ in diameter, are formed on amoebae dying after a week in captivity. Zoospores were not actually observed, but may be assumed to proceed from the plurinuclear resting cells and to act as sources of infection. The fungus is a Phycomycete and presumably belongs near the Cladochytriaceae in the Chytridiales. Its habit is definitely parasitic, but the extent of the injury could not be appraised.

NEEDHAM (N. V.). **A bacterial disease of Aphis rumicis Linn., apparently caused by Bacillus lathyri Manns and Taubenhaus.**—*Ann. appl. Biol.*, xxiv, 1, pp. 144–147, 1937.

The author states that an organism culturally similar to *Bacillus lathyri* [*R.A.M.*, xv, p. 101] was isolated from dead and surface-

sterilized individuals of a colony of *Aphis rumicis* showing an abnormally high mortality, in that the aphids died within 24 hours from their removal from the broad bean (*Vicia faba*) host plant on which they were raised, while control colonies survived for four days.

Butler (E. J.). **Acladium castellanii Pinoy and the existence of the so-called acladiosis of Castellani.**—*Parasitology*, xxix, 2, pp. 259–265, 1 col. pl., 9 figs., 1937.

Following a summary of previous records and descriptions of the fungus known as *Acladium castellanii* [*R.A.M.*, xvi, p. 483], a human pathogen in the south-east of Asia and Europe and in Brazil, the author gives details of his studies of cultures of the organism received from R. Craik (who renamed it *Pseudomicrosporon castellanii* in *J. trop. Med.* (*Hyg.*), xxvi, p. 184, 1923) and Castellani.

The fungus was grown on various natural substrata and laboratory media, of which carrot and potato agar proved to be the most suitable. On the former the colonies were white or gradually turned yellow, whereas on the latter they changed from white to deep brown or black. In the early stages of growth there was some indication of the *Acladium* type of sporing, which was soon superseded, however, in vigorous cultures by the formation of clusters of piriform to oval, hyaline conidia, 4·5 to 7 by 3 to 4 $\mu$, at the ends of the lateral hyphal branches. These organs are either inserted directly on the hyphae or attached to the latter by means of small, tooth-like processes sometimes long enough to form a kind of stalk. Craik's 'facet of articulation' is usually recognizable only in the conidium-like bodies formed on submerged hyphae. Tapering coremia, composed of broader and straighter hyphae than those constituting the creeping mycelium, were formed at an advanced stage in active cultures, especially on carrot, and gave rise to abundant conidia. Unicellular, spherical or occasionally clavate chlamydospores were observed principally in the submerged growth. The aerial conidia appear to belong to the type termed 'radula spores' by E. W. Mason in his Annotated Account of Fungi received at the Imperial Mycological Institute, List II (Fascicle 2), p. 9, 1933, and are regarded by the writer as thallospores rather than as true conidia, especially in the light of their presumed connexion with the above-mentioned spore-like bodies in the submerged mycelium.

*A. castellanii* closely resembles the descriptions of human and animal pathogens of the form genus *Sporotrichum* (*Rhinocladium* of some authors) [see next abstract], and it is obvious from comparative studies of this fungus and *S. schenckii* [ibid., xvi, p. 254] that the agent of acladiosis must at any rate be referred to the genus *Sporotrichum* and probably to the species *S. schenckii*, the limits of which are believed to be sufficiently wide to embrace a number of the so-called 'new species' of the genus subsequently recorded as human and animal pathogens. *S. councilmani* [ibid., xiv, p. 405], for instance, is considered by C. W. Dodge [ibid., xv, p. 368] to be only a variety of *S. schenckii*, and it may be assumed that *A. castellanii* occupies a similar position. Such being the case, the use of the term 'acladiosis' to denominate a distinct disease should be discontinued.

Hope (E.). **Sporotrichosis among violinists.**—*J. Lab. clin. Med.*, xxii, 7, pp. 708–711, 1937.

A species of *Sporotrichum* was isolated from submaxillary lesions in several students belonging to the same musical organization and from the chin rests of their violins, which obviously served as agents in the transmission of infection from one person to another. No pathological symptoms developed in rats inoculated with the fungus, which was recovered, however, from the liver and spleen.

Langeron (M.) & Milochevitch (S.). **Sur une méthode employée par Acton et Dey pour régénérer les cultures pléomorphisées des dermatophytes.** [Note on a method used by Acton and Dey for the regeneration of pleomorphized cultures of dermatophytes.]—*Ann. Parasit. hum. comp.*, xv, 2, pp. 177–181, 1937.

The authors conducted experiments to check the results recently described by Acton and Dey (*Indian med. Gaz.*, xix, p. 601, 1934), who claimed to have restored their original character to pleomorphic cultures of a number of species of *Microsporon*, *Ctenomyces*, *Achorion*, and *Epidermophyton* by growing them on feathers, on which they were allowed slowly to desiccate. The present work did not support these findings. Once entirely established, pleomorphism was found to be irreversible [cf. *R.A.M.*, xvi, pp. 100, 383], but using cultures in a less advanced stage of pleomorphism, colonies may be sometimes obtained, presenting more or less typical characters, in direct dependence on the degree of modification attained by the fungus.

Bigham (A.). **Investigations into the presence of yeast-like organisms in scaly lesions.**—*Brit. J. Derm.*, xlix, 2, pp. 74–79, 1937.

This is a summary of observations on the presence of yeast-like organisms in 50 cases of scaly disorders of the skin, with special reference to the *Pityrosporon* of Malassez [*P. malassezi*: ibid., xvi, p. 316]. This fungus was present in scales from the scalps of seven cases of seborrhoeic dermatitis, two of eczema, four of psoriasis, seven of pityriasis rosea, one of alopecia areata, and one of nasal carcinoma. It was, however, also detected in the scalps of 20 normal persons, and is not believed to be a primary cause of disease, some underlying factor, possibly of a metabolic order, being required to stimulate it to pathogenicity.

Taber (K. W.). **Torulosis in man.**—*J. Amer. med. Ass.*, cviii, 17, pp. 1405–1406, 1937.

Following a general survey of the available knowledge concerning human torulosis [*R.A.M.*, xv, pp. 222, 651], the writer gives clinical details of a fatal case of this disease in an elderly woman. The organism isolated from the sputum developed a profusion of shiny, salmon-pink colonies and corresponded in general cultural characters to *Cryptococcus pararoseus*.

Levin (E. A.). **Torula infection of the central nervous system.**—*Arch. intern. Med.*, lix, 4, pp. 667–684, 7 figs., 1937.

Full clinical details are given of two fatal cases of torulosis [see preceding abstract] of the central nervous system caused by *Torula*

*histolytica* [*Cryptococcus hominis* or *Debaryomyces neoformans*: *R.A.M.*, xvi, p. 534], both in adult males. The organism, isolated from the spinal fluid, grows readily but slowly on the standard bacteriological media, though its development is favoured by an acid substratum, e.g., Sabouraud's maltose agar. Growth is equally profuse at room temperature or in the incubator. The colonies first appear as minute, elevated, whitish, circular, glistening dots with well-defined margins, of a moist, pasty consistency, turning yellowish-brown with age; they are Gram-positive at first, later Gram-negative. The most characteristic feature of the fungus—a clear zone or halo surrounding each cell—is conspicuous in India ink preparations of one-month-old colonies. The sugar-fermenting capacity of *D. neoformans* is very slight. In laboratory animal (white mice) tissues fungal cells range from minute, round objects only a few $\mu$ in diameter, to large, circular, spherical or oval bodies, 40 to 50 $\mu$ in diameter, with sharply defined margins and often with double contours. Capsule formation and staining reactions are variable. Minute granules are frequently visible within the cells. Reproduction in the tissues, as in culture, is effected solely by budding.

Cottini (G. B.). **Due casi di onicomicosi favosa.** [Two cases of onychomycosis of the favus type.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xv, 1, pp. 66–68, 1 pl., 1937.

Clinical details are given of two cases of onychomycosis, one in a five-year-old girl and the other in a three-year-old boy, caused by *Achorion schoenleini* [*R.A.M.*, xvi, pp. 39, 252, 316, 317, *et passim*, and next abstract].

Lewis (G. M.), Rosenfeld (H.), & Hopper (Mary E.). **Favus of the glabrous skin.**—*Med. Rec., N.Y.*, cxlv, 5, pp. 189–193, 3 figs., 1937.

Attention is drawn to the involvement of *Achorion schoenleini* [see preceding abstract] in superficial infections of the smooth skin, which probably account, judging by the writers' recent observations in New York, for nearly 30 per cent. of all cases of favus. If the lesions on the glabrous skin are not typical scutulae, they may resemble tinea circinata or be present as ill-defined, erythematous, and scaly areas. Only one of eleven cases [four of which are here described] showed infection of the nails following invasion of the scalp, the smooth skin in this instance being unaffected.

Davis (A. H.) & Warren (E. L.). **Pulmonary moniliasis: report of a fatal case.**—*J. Lab. clin. Med.*, xxii, 7, pp. 687–697, 3 figs., 1937.

Following a review of the literature on pulmonary moniliasis, the writers describe a fatal case of the disease in a 45-year-old man due to *Monilia* [*Candida*] *albicans* [*R.A.M.*, xvi, p. 533], the morphological, cultural, biochemical, and serological characters of which are discussed, with observations on the pathogenicity of the fungus to man and laboratory animals.

Clerf (L. H.) & Bucher (C. J.). **Blastomycosis of the larynx.**—*Ann. Otol., &c., St Louis*, xlv, 4, pp. 923–939, 11 figs., 1936.

The morphological, cultural, and biochemical characters of the fungi

isolated from the larynx in five cases of chronic inflammatory processes simulating tuberculosis [cf. preceding abstract] are summarized, together with observations on their pathogenicity to laboratory animals. In two of the cases the organism was referable to *Monilia* (Castellani), in two to *Blastodendrion* [*R.A.M.*, xv, p. 367], and in one to *Candida krusei* [ibid., xvi, p. 177].

Balestrieri (F.). **Su di un caso di moniliasi polmonare.** [On a case of pulmonary moniliasis.]—*Riv. Pat. Clin. Tuberc.*, x, 4, pp. 229–232, 1936.

From the sputum of a 25-year-old agricultural labourer suffering from bronchial disturbances the writer isolated on Sabouraud's agar a fungus of the *Monilia mannitofermentans* group [*R.A.M.*, viii, p. 574], filtrates from cultures of which induced a positive reaction on intradermal infection into the patient but were negative to other persons.

Looper (E. A.). **Mycotic infections found in the trachea and bronchi.**—*Ann. Otol., &c., St Louis*, xlv, 4, pp. 1153–1164, 1936.

Drawing attention to the prevalent confusion between tuberculosis and bronchomycotic conditions [*R.A.M.*, xvi, p. 382], the writer gives clinical details of eleven cases of disease of the lower respiratory tract associated with fungal infection, e.g., by *Aspergillus fumigatus*, *A. glaucus* [ibid., xvi, p. 317], *Coccidioides immitis* [ibid., xvi, p. 461], *Monilia*, and *Penicillium*. The importance of bronchoscopy in the recognition and correct diagnosis of such disturbances is emphasized.

Tervet (I. W.). **An experimental study of some fungi injurious to seedling Flax.**—*Phytopathology*, xxvii, 4, pp. 531–546, 3 figs., 1937.

Severe seedling blight of Winona flax in steamed soil in the greenhouse was induced by strains of *Helminthosporium*, including an apparently undescribed species from barley, *H. sativum* from rye, barley, and flax, a form of the *Brachysporium* type from flax, and representatives of A. W. Henry's *Helminthosporium* N [*R.A.M.*, iv, p. 408] group from wheat and barley. Considerable injury in the shape of damping-off was further caused by strains of *Rhizoctonia* [*Corticium*] *solani* isolated from tomato, eggplant, flax, peas, barley, beans [*Phaseolus vulgaris*], sugar beet [ibid., xiv, p. 207], and rice, and by one of *R. bataticola* [*Macrophomina phaseoli*] from sugar-cane [ibid., xiv, p. 80], all from the United States; on the other hand, the strains of *C. solani* from potato were only slightly, if at all, pathogenic to flax. *Thielavia* [*Thielaviopsis*] *basicola*, isolated from flax roots [ibid., xiv, p. 362], under favourable conditions caused marked stunting, frequently accompanied by severe tap-root decay and extensive red and black lesions on the roots. *Ophiobolus cariceti* [*O. graminis*] from wheat also induced decay of the root system of flax. Under conditions conducive to infection, a strain of *Alternaria* from flax seed [ibid., xii, p. 220] is capable of causing severe damage to the roots. A *Pythium* isolated from wilt(*Fusarium lini*)-sick soil proved highly pathogenic to flax seedlings, only four out of 100 of which survived 13 days after planting; a strain from bean was equally virulent.

Six of the foregoing fungi, viz., *H. sativum* from rye, *T. basicola*,

*O. graminis*, *A.* sp., *C. solani* from flax, and *F. lini*, were tested for their pathogenicity to flax on maize (sandy loam), prairie, peat, and steamed (loam and sand) soils. Both *F. lini* and *H. sativum* were consistently virulent, though the symptoms induced by the latter varied according to the soil type. *O. graminis* and *T. basicola* did most damage on steamed soil, while the results obtained with *A.* sp. and *C. solani* were somewhat conflicting.

It would appear from these data that other fungi besides *F. lini* may be implicated in the decline of resistance to wilt under certain environmental conditions.

Esmarch (F.). **Pilzkrankheiten des Flachses.** [Fungal diseases of Flax.] —*Kranke Pflanze*, xiv, 4, pp. 66–71, 1 pl., 1 fig., 1937.

Popular notes are given on the symptoms, mode of infection, and control of the following diseases affecting flax in Germany (where the acreage under this crop is stated to have increased from 4,800 hect. in 1933 to 45,000 hect. in 1936) and elsewhere: wilt (*Fusarium lini*), anthracnose (*Colletotrichum lini*), grey mould (*Botrytis cinerea*), rust (*Melampsora lini*), and *Cladosporium herbarum* [*R.A.M.*, ix, p. 246], which covers the stems both of growing and stored plants, and may considerably impair the value of the crop.

Burkholder (W. H.). **A bacterial leaf spot of Geranium.**—*Phytopathology*, xxvii, 4, pp. 554–560, 1 fig., 1937.

*Phytomonas geranii* n. sp., the agent of a destructive brown spotting and necrosis of *Geranium sanguineum* leaves at Ithaca, New York, is a uniflagellate rod occurring singly, in pairs, or in short chains, 2 by 0·75 $\mu$, Gram-negative, forming primuline-yellow colonies on beef extract-peptone agar at 27° C., liquefying gelatine, alkalizing and clearing milk, reducing nitrates, forming ammonia and hydrogen sulphide, and utilizing dextrose, levulose, galactose, xylose, rhamnose, lactose, maltose, sucrose, raffinose, glycerol, and citric, lactic, malic, malonic, and succinic acids.

The interveinal lesions produced by *P. geranii* average 2·5 mm. in diameter, sometimes coalescing to cover relatively large areas of the leaf, on the upper side of which the spots are dark brown, often with a reddish tinge, while below they are slightly water-soaked. The stems and petioles were only occasionally attacked. The organism, in a virulent form, was isolated in March, 1936, from lesions on the leaves of *G. sanguineum* plants that had overwintered in the open under mulch and snow. Positive results were given by inoculation experiments with *P. geranii* on its own host, *G. maculatum* (which showed some degree of resistance), *G. pratense*, and *G. sylvaticum*, but the common red-flowering house geranium (*Pelargonium hortorum*) appears to be immune.

McCulloch (Lucia). **Bacterial leaf spot of Begonia.**—*J. agric. Res.*, liv, 8, pp. 583–590, 1 fig., 1937.

A brief account is given of a bacterial leaf spot of begonias, which is stated to be widespread in the United States, causing losses varying from 1 to 50 per cent., probably in direct dependence on the conditions

under which the plants are grown. The disease at first appears as tiny, clear specks on the lower surface of the leaf, gradually enlarging to more or less circular, translucent, pale green or colourless spots, becoming brown and opaque in the centre with a yellow, translucent halo, and measuring from 1 to 8 mm. in diameter. The spots are occasionally also found on the leaf bracts, but have not been observed on the petioles or veins. Severe attacks may lead to heavy defoliation of the plants. The organism isolated from young lesions is a slender, motile rod, rounded at both ends, occurring singly or in pairs, with a single polar flagellum, and averaging 0·9 to 1·8 by 0·3 to 0·4 $\mu$ in diameter. It is aerobic, Gram-negative, non-acid fast, sometimes with very indefinite capsules, does not produce spores or involution forms, liquefies gelatin, rapidly clears milk, produces ammonia and hydrogen sulphide, hydrolyses starch, does not reduce nitrates, grows well in Uschinsky's solution and makes a yellow growth on beef agar. It resists drying for 56 days or over, and its temperature relations are maximum 37° C., minimum below 8°, optimum about 28°, and thermal death point about 50°. It was experimentally shown to be pathogenic to all the species and varieties of begonias tested and very slightly to *Pelargonium*. The organism is considered to be new to science and is named *Bacterium flavozonatum*.

The development of the disease is stated to be favoured by warm, moist, poorly ventilated and crowded conditions, and could be effectively prevented by adequate spacing, with regulated temperature and moisture in the houses. Infected leaves should be removed and destroyed.

Monchot (E.). **Sur un nouvel Uromyces de l'Oeillet cultivé, Uromyces dianthi-caryophylli n. sp.** [On a new *Uromyces* of cultivated Carnation, *Uromyces dianthi-caryophylli* n. sp.]—*Rev. Path. vég.*, xxiv, 2, pp. 133–136, 1 fig., 1937.

Comparative measurements of the uredospores and teleutospores of *Uromyces caryophyllinus* [*R.A.M.*, xii, p. 107; xiii, p. 656; xiv, p. 244; xv, pp. 109, 733], *Uredo dianthicola* (herbarium material), and of a rust found on hothouse carnations in France showed that the former organs measured, respectively, 21 to 29 by 20 to 26 (generally 26 by 24) $\mu$, 21 to 35 by 18 to 26 (30 by 21) $\mu$, and 10 to 30 by 14 to 21 (24 by 18) $\mu$, while the teleutospore measurements of the first fungus were 23 to 31 by 16 to 22 (generally 25 by 20) $\mu$, and of the last up to 25 by 16 to 21 (21 by 19) $\mu$. In view of these and certain morphological differences, such as membrane thickness and number of germinative pores (of which the uredospores of the last-named fungus showed not more than three), the author considers that *Uromyces caryophyllinus* is a stable species in spite of the different sources of the material examined, that *Uredo dianthicola* is a distinct species not synonymous with the foregoing, and that the carnation rust is a new species, which is accordingly named *Uromyces dianthi-caryophylli* n. sp. [without a Latin diagnosis], and is pathogenic to hothouse carnations.

Hildebrand (E. M.). **Infectious hairy root on Rose.**—*Plant Dis. Reptr*, xxi, 5, pp. 86–87, 1937. [Mimeographed.]

*Phytomonas* [*Bacterium*] *rhizogenes*, the agent of hairy root of apple

[*R.A.M.*, xvi, p. 191], was isolated from three out of four dormant rose (*Rosa multiflora japonica*) cuttings from a New England nursery and inoculated with positive results into *Kalanchoë daigremontiana*. After six weeks in pots 20 out of 26 diseased rose cuttings showed fresh hairy root developments, the majority of infections occurring on the underground stem, presumably through wounds inflicted in preparation for planting. This is believed to be the first record of natural infection by *Bact. rhizogenes* on rose cuttings. The material was reported to have originated in Texas, and about half the stand was attacked.

Di Micheli (G.). **À propos d'un Oidium du Laurier pas encore signalé.** [On a hitherto unreported *Oidium* on Laurel.]—*Boll. Sez. ital. Soc. int. Microbiol.*, ix, 4, pp. 84–85, 1937.

Laurel (*Laurus nobilis*) hedges in gardens in Florence showed on the under surfaces of the leaves a white, floury efflorescence due to *Oidium erysiphoides*, not previously recorded on this host in Europe. Adult leaves were those most seriously attacked, but the younger ones when infected were slightly curled and discoloured. The lower surfaces of the affected leaves became brown and spotted.

Buddin (W.) & Wakefield (E[lsie] M.). **A stem-canker disease of Gardenias.**—*Gdnrs' Chron.*, ci, 2623, pp. 226–227, 4 figs., 1937.

One- and two-year-old *Gardenia* plants raised from cuttings at a Middlesex nursery examined in January, 1937, were affected by a disease associated with an irregular foliar discoloration, especially at the leaf bases, and the development of swollen cankers over almost the entire underground part of the stems. Six-year-old plants subsequently observed at a Surrey nursery showed numerous stem cankers extending up to 1 ft. above soil-level. In the centre of these aerial cankers the wood was exposed over a length of 1 to 3 in., the affected area being surrounded by an extensive formation of wound callus. The stem cankers were found invariably to start from the bases of the 'snags' left after cutting the flowers. Both green and woody stems, 'snags', and cankers bore pycnidia of the *Phomopsis* type, the flattened cavity of which was lined with hyaline, non-septate, awl-shaped sporophores, 15 to 20 $\mu$ long, exuding under moist conditions pale ochraceous-salmon to Capucine buff masses or short tendrils of fusiform spores (hyaline when examined singly), ranging from 7 to 15 by 2·5 to 4·5 $\mu$ (average 9 to 11·5 by 3 to 4 $\mu$), and so agreeing fairly closely with the A spores of a *Phomopsis* isolated from the same host in the United States [*R.A.M.*, xiv, p. 107], with which the fungus under observation is thought to be probably identical. Both are weak wound parasites controllable by the rational application of drastic sanitary measures.

Buddin (W.). **The grey bulb rot of Tulips and its control.**—*J. Minist. Agric.*, xliv, 1, pp. 54–59, 3 figs., 1937.

Besides attacking tulips, especially the Darwin varieties, *Sclerotium tuliparum* [*R.A.M.*, xv, pp. 135, 632] also occurs, though generally less severely, on iris [ibid., vii, p. 378], particularly the Imperator and Wedgwood varieties, *Scilla*, crocus, *Ixia*, *Fritillaria* [ibid., v, p. 557], *Colchicum* [ibid., xi, p. 423], hyacinth, and narcissus [ibid., xiv, p. 135].

The very young tulip shoots pushing through the soil become diseased first, and observations showed that bulbs planted with one-half to two-thirds of their surface protruding mostly remained healthy even in badly diseased soil.

In experiments with William Copland tulip bulbs planted in boxes of 25 each, in two kinds of infected soil subjected to various treatments, steaming completely eliminated the disease in both soils, soil treatment with formalin resulted in 0 and 1 healthy plants, respectively, and soil treatment with a powder containing chloronitrobenzol as the active agent 13 and 21 healthy plants, respectively, compared with one healthy plant out of 75 bulbs used in the controls. Bulbs shallow-planted in untreated soil and covered with long straw during rooting gave 21 and 24 healthy plants, respectively. In a similar test bulbs planted in untreated soil yielded one marketable flower, those in steamed soil 24, those in formalin-treated soil 9, and those in soil treated with the powder in the top layer only 23, as against 22 for the bulbs shallow-planted in the untreated infected soil.

The author mentions incidentally that investigations at Reading have shown that shanking of tulips [ibid., xii, p. 140] is caused by *Phytophthora cryptogea* and *P. erythroseptica*, almost perfect control of which has repeatedly been obtained by heating the contaminated soil with a 2 per cent. solution of commercial formalin several weeks before planting.

Price (W. C.). **Classification of Lily-mosaic virus.** —*Phytopathology*, xxvii, 4, pp. 561–569, 5 figs., 1937.

The symptoms of cucumber mosaic [*R.A.M.*, xvi, p. 518], cucumber mosaic strain 6, and celery mosaic [see above, p. 584] in *Lilium longiflorum* were found to be similar to those of lily mosaic [ibid., xv, p. 507] in this host, consisting of elongated, yellow spots enlarging and sometimes coalescing to produce foliar mottling with a tendency to necrosis. On transference from *L. longiflorum* to Turkish tobacco, the lily mosaic virus caused the development of localized zonate, yellow spots, sometimes surrounded by a necrotic periphery. Isolations from the affected tobacco foliage yielded a rapidly moving virus (herein referred to as the 'passage strain of lily mosaic virus') inducing a characteristic mottling of young tobacco leaves, and, on retransference to *L. longiflorum*, the typical symptoms of lily mosaic. The passage strain was readily transmitted from tobacco to Improved Long Green and Early Fortune cucumbers, on which it produced bright yellow chlorosis along the veins, accompanied in some instances by a mild yellow mottling, and retransferred to tobacco. The lily mosaic virus was conveyed directly to Golden Gem Midget *Zinnia elegans* plants, which developed localized yellow leaf spots, and the passage strain was also transmitted to the same host, resulting in a systemic yellow and green mottling similar to that induced by certain cucumber mosaic viruses. An inoculation experiment carried out with the lily mosaic virus passage strain, followed after a 19-day interval by cucumber mosaic 6, on ten young *Z. elegans* plants convincingly demonstrated the immunizing action of the former against the latter [cf. ibid., xvi, p. 414], the results being further substantiated by a second test comprising 20 plants. It is thus

apparent that the two viruses under observation are closely related, and that the lily mosaic virus should be placed in the cucumber mosaic virus category.

Smith (O. F.). **A leaf spot disease of red and white Clovers.**—*J. agric. Res.*, liv, 8, pp. 591–599, 4 figs., 1937.

The disease briefly described in this paper was first observed in 1935 on red and white clovers (*Trifolium pratense* and *T. repens*) in a number of pastures near Madison, Wisconsin, where the damage caused by it was slight, since the lesions, in the form of dark brown, often irregularly shaped, concentrically zonate spots, similar to those produced by *Macrosporium* [*Thyrospora*: *R.A.M.*, xiii, p. 327] *sarcinaeforme* on red clover, were exclusively confined to comparatively few leaves of the hosts. Isolations from the spots readily yielded a fungus which was experimentally shown to be also pathogenic to *T. repens* var. *giganteum*, *T. hybridum*, *T. incarnatum*, *Melilotus alba*, *M. officinalis*, *M. indica*, and *Medicago sativa*. Failure, however, to produce spores or sclerotia in culture, and the absence of these organs in nature, prevented the identification of the fungus. Field and laboratory observations showed that under conditions of high humidity the aerial mycelium grows over the surface of infected leaves; a group of short diverging hyphae, closely applied to the surface, is formed at the point of contact of the tips of the aerial hyphae and the leaf; entrance into the host tissue is effected directly through the epidermis, either through or between the epidermal cells, after which the fungus spreads both inter- and intracellularly throughout the leaf tissue, killing the host cells in advance of its progress. Temperatures of 24° and 28° C. are most favourable for growth of the fungus in culture and for infection of red clover leaves.

Chaze (J.). **Sur la production de choline dans les caryopses et les plantules de l'Ivraie enivrante, en rapport avec le parasitisme.** [On choline production in Darnel caryopses and seedlings in relation to parasitism.]—*C.R. Acad. Sci., Paris*, cciv, 19, pp. 1443–1445, 1937.

The writer reports his experimental observations on the elaboration of large quantities of choline in the caryopses and seedlings of darnel (*Lolium temulentum*) harbouring an endophytic fungus [*R.A.M.*, xvi, p. 267]. This nitrogenous base being absent from non-infected plants, there is reason to postulate a correlation between its development and the activities (probably diastatic) of the parasite.

Dullum (N.) & Esbjerg (N.). **Forsøg med Rentabiliteten ved Sprøjtning af Æbletræer. II.** [Experiments in the profitability of Apple tree spraying. II.]—*Tidsskr. Planteavl*, xlii, 1, pp. 1–28, 1937. [English summary.]

Continuing the investigations initiated in Denmark in 1923 to determine the most profitable spraying schedules for the control of apple scab (*Venturia*) [*inaequalis*: *R.A.M.*, xi, p. 185] and red spider [*Tetranychus telarius*], the writers fully describe and tabulate the data of a series of tests carried out from 1929 to 1935 with different combinations of Bordeaux mixture (½ : 1 : 100) and lime-sulphur (2 : 100) applied in the pink bud and calyx stage and three and six weeks, respectively,

after the latter. The disease was adequately controlled by all the treatments, while 44 per cent. infection occurred on the unsprayed trees. The least spraying damage was caused by the schedule in which the two first treatments consisted of lime-sulphur and the two last of Bordeaux mixture, and the most by the use of the latter throughout. In general, the replacement of Bordeaux mixture by lime-sulphur for the immediately pre- and post-blossom treatments represented an economy (of Kr. 304 and Kr. 799 per hect. per annum during the periods from 1929 to 1932 and 1932 to 1935, respectively), and an improvement in the quality and quantity of the treated fruit, but certain varieties e.g., Lane's Prince Albert and Lundbaek did not tolerate lime-sulphur. The Mølleskov and Cox's Pomona varieties were the most susceptible to scab in these tests, Filipa being relatively resistant.

Loewel (E. L.). **Ob 72, ein neues Spritzmittel gegen Fusicladium.** [Ob 72, a new spray against *Fusicladium*.]—*Gartenbauwiss.*, xi, 2, pp. 208–220, 7 figs., 1937.

Spraying experiments since 1935 in Altland on several important commercial apple and pear varieties showed that the spray material Ob 72 of the I.G. Farbenindustrie A.G., Höchst-am-Main, was equal in value to lime-sulphur–lead arsenate for the control of apple and pear scab (*Fusicladium* spp.) [*Venturia inaequalis* and *V. pirina*], and but little inferior, if at all, to cupric sprays [*R.A.M.*, xvi, p. 541]. Apart from its efficacy against the parasites, it is stated to have no effect at all, either injurious or stimulating, on the foliage of the sprayed trees, and to be non-toxic to bees. It mixes well with crude nicotine, and appeared to increase the resistance of stored apples and pears to storage rots and spots.

Schmidt (M.). **Venturia inaequalis (Cooke) Aderhold. VII. Zur Morphologie und Physiologie der Widerstandsfähigkeit gegen den Erreger des Apfelschorfes.** [*Venturia inaequalis* (Cooke) Aderhold. VII. Contribution to the morphology and physiology of resistance to the agent of Apple scab.]—*Gartenbauwiss.*, xi, 2, pp. 221–230, 18 figs., 1937.

After briefly referring to his previous communication in this series [*R.A.M.*, xvi, p. 187], the author gives details of his microscopic studies of the development after experimental inoculation in the leaves of the Gelber Edel apple variety of two monospore strains of *Venturia inaequalis*, to one of which the apple variety is susceptible, and resistant to the other; the results showed that while the mycelium of both strains is capable of entering the leaf tissues, that of the non-pathogenic strain is strongly retarded in its growth inside the host, and remains localized to very small spots of necrotic tissue, which macroscopically appear as minute reddish or chlorotic flecks. The same phenomena were also observed in a few other apple varieties when inoculated with a monospore culture of *V. inaequalis* to which they are resistant. Inoculations were also carried out with conidia from Landsberger Pippin on the leaves of a 1-year-old graft from a 7-year-old apple seedling which throughout its previous life had shown complete immunity from scab, in spite of the heavy infection of the surrounding trees; the inoculated

leaves developed minute red necrotic spots, within which mycelia strands were found. These findings are considered to suggest that resistance in the apple to scab is due to a reaction of the host cytoplasm against invasion by the parasite.

HERBST (W.), RUDLOFF (C. F.), & SCHMIDT (M.). **Vergleichend-morphologische Studien an verschiedenen Venturiaarten.** [Comparative morphological studies on various species of *Venturia*.]—*Gartenbauwiss.*, xi, 2, pp. 183–207, 25 figs., 1937.

The results of the investigations fully discussed in this paper showed that single-spore cultures of *Venturia aucupariae*, *V. crataegi* [*R.A.M.*, xii, p. 205], and *V. ditricha*, like those of *V. inaequalis* and *V. pirina*, differed widely from one another in morphological and physiological characters, the number of different forms found being exceptionally large. There was evidence supporting the view expressed by certain investigators that in *V. inaequalis* and *V. pirina* the different morphological types and their combinations represent hereditary races, an assumption which the authors are inclined to extend to the other three species studied. The different species varied in their production of conidia on certain culture media, but variations also occurred within one and the same species. The size and shape of the conidia were found, however, to be stable and of specific value from the standpoint of taxonomy. A form of *Venturia* was found on a *Sorbus* [*Pyrus*] *domestica* tree, the conidia of which were very similar to those of *V. inaequalis*, and another on *S.* [*P.*] *aucuparia* with conidia very similar to those of *V. crataegi*, indicating that the specific limits and specialization of *V. aucupariae* and *V. crataegi* should be further investigated and defined more clearly. In a 4-month-old culture of *V. ditricha* perithecia were found, provided with strong bristles, and one of which contained normally developed asci and ascospores; 14 cultures raised from the latter, including six monospore cultures, were of the same type as the original culture, suggesting that this strain of *V. ditricha* is homothallic, or that possibly the whole species is homothallic, a question which is now being further investigated.

MACLACHLAN (J. D.) & CROWELL (I. H.). **Control of the Gymnosporangium rusts by means of sulphur sprays.**—*J. Arnold Arbor.*, xviii, 2, pp. 149–163, 1 pl., 1937.

In experiments on the control of *Gymnosporangium juniperi-virginianae*, *G. globosum*, and *G. clavipes* on (*a*) apples and other Pomaceous hosts and (*b*) *Juniperus* spp. [*R.A.M.*, xvi, p. 542] in Massachusetts, satisfactory results were obtained with the following sulphur fungicides: linco colloidal, liquid lime (1 in 50), the Nova Scotia formula (4·2 lb. aluminium sulphate, 1·4 lb. liquid lime-sulphur, 1·2 lb. calcium arsenate, and 48 galls. water), and flotation sulphur, with the addition of the 'S.S.S. sticker' and spreader (Mechling Chem. Co., Canton, New Jersey). Against *G. juniperi-virginianae* on apples six applications (or seven if dry conditions prevail during May) should be given at 7- to 10-day intervals, beginning before the first rain after the emergence of the young leaves. A similar schedule may be adopted for *G. globosum* on susceptible Pomaceae, e.g., *Crataegus jonesae*. Both rusts are con-

trollable on *J. virginiana* by four sulphur treatments at three- to four-week intervals, the first being given before the initial aecidiospore discharge (middle of July for *G. juniperi-virginianae* and 1st August for *G. globosum*). *G. clavipes* on *C.* and *Amelanchier* spp. may be combated by three applications of one of the above-mentioned preparations at 7- to 10-day intervals, commencing at the opening of the blossom buds. *J. virginiana* and *J. communis* should be sprayed at three- to four-week intervals from the latter part of May onwards, terminating early in July if infection arises from *A.* spp. but not until September where *C.* spp. constitute the source of infection.

De Long (W. A.). **Calcium and boron contents of the Apple fruit as related to the incidence of blotchy cork.**—*Plant Physiol.*, xii, 2, pp. 553–556, 1937.

Analysis of the calcium and boron contents of parallel samples of Stark apples from different orchards, some of the fruits being visibly affected by blotchy cork [*R.A.M.*, xv, p. 663] while others were apparently unaffected and gathered from apparently unaffected trees, failed to reveal any direct relation between the boron and calcium contents, and did not show any consistent relation of boron content to blotchy cork incidence. The observation previously made [loc. cit.], however, that a low calcium content is associated with the occurrence of the condition was again confirmed.

Mezzetti (A.). **Un marciume di alcune varietà di Pere.** [A rot of certain Pear varieties.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 121–146, 7 pl., 1937.

From inoculation experiments [which are described] carried out on Passa Crassana and Bergamotte Espérèn pears with *Pleospora herbarum* and an *Alternaria* provisionally identified as *A. tenuis*, isolated from rotted fruits still attached to the trees of these and other varieties, the author tentatively concludes that both fungi can infect wounded pears even at 7·5° to 10° C. The symptoms produced resembled those seen in nature only when immature pears were inoculated, and it is probable that in any one variety susceptibility to infection is related to the degree of maturity reached by the fruit at the time of attack. Under certain conditions in nature either organism or both together can cause rotting of pear fruits attached to the trees, even if unwounded. In the experimental conditions, the *Alternaria* produced abundant conidia and *P. herbarum* abundant conidia and perithecia, the former organs developing at 16° to 18° but not at 7·5° to 10°, and the latter at both temperature ranges. In nature, both fungi probably spread by means of the conidia, which are generally produced on the fruits. Infection is favoured by the use during several seasons of paper bags to protect the fruits; these should be used only once.

**Report of the Low Temperature Research Laboratory, Capetown, 1934–1935.**—165 pp., 1 pl., 20 figs., 32 graphs, 1936. [Received June, 1937.]

In the section of this report [cf. *R.A.M.*, xiv, p. 491] dealing with the cold storage of plums (by Rees Davies, W. W. Boyes, and E. Beyers)

it is stated that Santa Rosa fruit reaching the over-ripe stage after previous cold storage developed numerous small, sunken areas on the surface; the tissue immediately under the sunken epidermis was hard and apparently suberized, and surrounded by a zone of injected tissue sometimes reaching almost to the centre. The consignment ripened without previous cold storage did not show the condition. Similar pitting occurred on Wickson fruit placed in cold storage before ripening.

The maximum amount of internal breakdown occurred in stage A (least mature) Santa Rosa plums stored at 34° F., and in stages B and C, at 37°, breakdown decreasing as the storage temperature was adjusted above or below these extremes. No fruit was stored at 45°, but this is considered as representing, probably, the storage temperature at which no breakdown would occur. At the lowest temperature tested (31°) under 10 per cent. of the plums developed breakdown. The data obtained indicated that under the present conditions of transport (overall fruit temperature of 35°) plums picked when completely red, when showing 75 per cent. colour, and when showing 50 per cent. colour, will have approximately 60 to 70, 30 to 40, and 20 per cent. internal breakdown, respectively. In most cases the optimum storage temperature for internal breakdown was 37°. In the Santa Rosa variety the flesh was injected and greyish, in Wickson it was dark or brown, in Gaviota it was injected or translucent, and jelly-like, while in Kelsey, as in Gaviota, scarcely any discoloration was present. In the condition referred to as 'browning' the flesh is normal except for a faint general discoloration evident in fruit stored for a long period (generally at 31°); the browning may start at the surface and proceed inwards or vice-versa. While picking at 80 to 90 per cent. red colour has been recommended as a general rule for plums to avoid bladderiness, the data obtained indicate that picking at this stage would still give 40 to 50 per cent. internal breakdown at a storage temperature of 35°. Seasonal factors appear to play an important part in the production of bladderiness in Kelsey plums. With Gaviota plums the best storage temperature was 31°, at which no internal breakdown occurred during the period necessary for export.

Leatheriness was induced in Kelsey fruits ripened at 45°, the temperature being too low to permit normal ripening.

E. Beyers states that the view that delayed storage was an important factor in the shedding of grape berries, involving wilting and dehiscence of the stalks after picking, was confirmed by a survey in 1934–5 which showed that water relationships in the vineyard affect the condition. Dropping of berries never exceeded 6 per cent. in irrigated vineyards but reached 62 per cent. in unirrigated ones. That some vineyards may be deficient in soil moisture is indicated by the fact that the areas chiefly affected are subjected to very hot, dry atmospheric conditions in summer. After picking the chief factor is the time elapsing before placing the grapes in cold storage, shedding increasing with increasingly delayed storage. Less dropping occurred in fruits picked in the riper than the earlier stages. When a number of varieties were tested less shedding occurred, on the whole, at storage temperatures of 31° and 34° than at 29°. Measures preserving the green condition of the stalks after picking reduce drop.

J. M. Rattray found that wastage of grapes by *Botrytis* [*cinerea*] was reduced by picking during the afternoon and was unaffected by delay in storage.

D. J. Dreyer states that experimental consignments to England of grapes in iodized wraps clearly showed that such wraps reduced mouldiness [ibid., xvi, p. 437] as compared with plain ones, though better means of using such wraps remain to be devised.

Experiments by J. M. Rattray on the borax treatment of oranges against *Penicillium digitatum* showed that the percentage waste declined as the concentration of the borax rose from 1 to 8 per cent., and also, to some extent, as the period of immersion was increased; immersions for 2 and 3 minutes in an 8 per cent. solution alone gave satisfactory control. The percentage waste diminished also as the temperature of the 5 per cent. and 8 per cent. solutions was raised, though increases of temperature of, and longer immersion in, the 1 per cent. and 3 per cent. solutions had little or no effect. The best treatment was 8 per cent. borax solution at 110° for 4 to 5 minutes.

Ruggieri (G.). **Sopra le micorize del Mandorlo.** [On the Almond mycorrhiza.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 165–168, 2 figs., 1937.

The roots of almond trees growing in hot, dry conditions in the province of Syracuse, Sicily, showed in the primary cortex an inter- and intracellular endophytic mycelium of the Phycomycetoid type [*R.A.M.*, vi, p. 221; viii, p. 190] with numerous short branches terminating in sporangioles. The cells containing the last-named organs were devoid of starch. No vesicles were observed. The mycelium on the external surface of the roots consisted of hyphae 5 to 6 $\mu$ in diameter with a very thick, fuliginous wall. The intracortical hyphae measured 3·5 to 4·5 $\mu$ in diameter. When observed at the end of February the autotrophic roots were nearly all dead, though they had been active at the end of the previous growing period. Most of the small living roots were infected.

Hartzell (A.). **Movement of intracellular bodies associated with Peach yellows.**—*Contr. Boyce Thompson Inst.*, viii, 5, pp. 375–388, 6 figs., 1937.

The author states that the microscopic examination of living tissues of peach trees affected with yellows [*R.A.M.*, xv, p. 730; xvi, p. 368] showed the presence in the cells of rapidly moving bodies which, at a magnification of 2,300, were found to be tadpole-shaped, the tail-like projection not being visible at low magnifications; in size they ranged from barely visible to 3 $\mu$ in length, and varied in number from one to as many as 50 in a single cell in advanced stages of the disease. In root tip tissue they were observed at least three months before the characteristic leaf and twig symptoms appeared, and were also found in style hairs of blossoms from diseased trees as soon as the flower buds opened. Bodies similar in appearance were observed in the cells of the intestinal wall and salivary glands of the leafhopper (*Macropsis trimaculata*) vector of peach yellows, which had fed for from one to three weeks on diseased

trees. They were either entirely absent or rare in the tissues of healthy peach trees and of leafhoppers reared on normal trees. Similar intracellular inclusions were also found in the cells of the midrib of aster plants affected with aster [*Callistephus chinensis*] yellows [ibid., xv, p. 808].

Cinematographic records prepared from living tissues showed the movements of the intracellular bodies in the living tissues of both the diseased peach trees and of the intestinal wall and salivary glands of the insect vector, and also in the released cell juice from infected tissues of both hosts. The bodies appeared to be moving for the most part in the cell sap of the vacuole, in a number of cases in a direction opposite to that of the protoplasmic stream. Evidence is adduced that the movement of the bodies is not Brownian. The studies are considered to show clearly that the bodies are not artifacts, and that in general they resemble the cellular inclusions of unknown nature associated with certain diseases of vertebrates, such as smallpox and rabies.

SCHNEIDERS (E.). **Über die Zellstäbe und ihre phytopathologische Bedeutung.** [On intracellular cordons and their phytopathological significance.]—*Gartenbauwiss.*, xi, 2, pp. 237–250, 9 figs., 1937.

In discussing at some length the etiological relationship of intracellular cordons in the vine to the 'Reisigkrankheit' of this host [*R.A.M.*, xvi, p. 231], the author points out that the occasional presence of these formations has been recorded by various investigators in the wood of a wide range of higher plants, suggesting that under certain conditions any plant may produce them. He then gives a brief account of experiments, in which blackberry cuttings, the wood of which does not normally contain intracellular cordons, were planted in soil heavily infected with 'Reisigkrankheit', in soil which had formerly borne diseased vines but had been treated with carbon disulphide, and in healthy soil, with the result that the first group developed symptoms strongly reminiscent of the 'Reisigkrankheit', and their wood was found to contain numerous intracellular cordons, while that of the second group showed only a few, and that of the third group did not contain any at all. In investigating a severe case of dying-off of cherries on the Rhine (a report on which was published by the author in collaboration with J. Fuess in *Gartenbauwiss.*, ix, 5, 1935), on soil which, according to the local growers had to be abandoned for the vine because of the 'Reisigkrankheit', it was shown that the wood of the dying trees contained a large number of intracellular cordons, while that of healthy trees or of trees affected with gumming did not contain any. Finally, the histological examination of the stems of potatoes affected with leaf roll, rosette, streak, or mosaic, showed that they also contained a large number of intracellular cordons, which are normally absent in healthy plants.

While these investigations are admittedly preliminary, and do not allow of forming any definite conclusions, they are strongly suggestive of an etiological connexion between the so-called virus diseases of plants and the intracellular cordons, and further research on these lines is advocated.

Schmidt (M.). **Infektionsversuche mit Sclerotinia cinerea an Süss- und Sauerkirschen.**—[Infection experiments with *Sclerotinia cinerea* on sweet and sour Cherries.]—*Gartenbauwiss.*, xi, 2, pp. 167–182, 9 figs., 2 graphs, 1937.

An account is given of experiments in 1935, the results of which showed that both sweet and sour cherries may develop twig and blossom blight when experimentally infected with conidia of *Sclerotinia cinerea* [*S. laxa*: *R.A.M.*, xvi, p. 190] either through the stigma or through cortical scratches on the shoots, infection in the latter case leading to the failure of the inflorescences above the point of inoculation to set fruit. They also indicated that sour cherries, and particularly the rough cherry [*Prunus cerasus* var. *austera*] are much more severely attacked by the fungus than sweet cherries, a fact which was confirmed by artificial inoculations in 1936 through cortical wounds on 13 varieties of sour and bitter-sweet and 12 varieties of sweet cherries. This work was done as a first step in an investigation of the possibility of developing commercial varieties of sour cherries resistant to the disease by hybridization, and included a number of hybrid seedlings; the results obtained with the latter are not included in this report, because of their strictly preliminary nature. A significant inverse correlation was found between the severity of wilting which resulted from inoculation and the amount of gum exuded at the point of infection, suggesting the possibility that gum may be a factor in the resistance of the less susceptible varieties.

Hoffman (M. B.) & Evans (J. A.). **Handling Strawberry plants to avoid losses.**—*Proc. N.Y. St. agric. Soc., 1937*, pp. 267–271, 1937.

The serious losses, ranging in some cases from 50 to 80 per cent. of the plants, from 'root rot' or 'black root' [*R.A.M.*, xv, p. 780] incurred in new strawberry plantings in New York State may, it is considered, have been due to winter injury, following on neglect of mulching [ibid., xiv, p. 180; cf. xvi, p. 394] and the active growing condition of the plants when received from the nursery.

Haas (R. C.). **Chlorine in relation to ring-neck in Avocado fruits.**—*Yearb. Calif. Avocado Ass., 1936*, pp. 60–62, [? 1937. Abs. in *Chem. Abstr.*, xxxi, 11, p. 3961, 1937].

'Ring-neck' usually occurs on avocado fruit stems or pedicels and consists in the development of dry areas separating more or less readily from the living tissue and leaving a scar. The stem half of the pulp or skin contains a larger percentage of total chlorine than the tip half, and the inner portion of the pulp is richer in chlorine than the outer. There is evidence of a relation between the chlorine content of the irrigation water, and of the pulp and skin of the fruit, and the state of health of the trees. The dry matter of the entire fruit pedicels of healthy avocados (Itzamna variety) contained 0·41 per cent. chlorine compared with 0·77 to 1·42 per cent. in the same organs of 'ring-neck' fruits, suggesting that chlorine or other salts may be a factor in the etiology of the disorder.

Wardlaw (C. W.). **Banana diseases. X. Further observations on Cercospora leaf spot of Bananas.**—*Trop. Agriculture, Trin.*, xiv, 4, pp. 117–118, 1937.

Banana leaf spot (*Cercospora musae*) [*R.A.M.*, xvi, p. 545] first recorded in Trinidad at the Maqueripe Estate in 1934, has now spread generally throughout the island. In 1936, production was seriously affected, plants at all stages of development being severely spotted and commercial bunches spoilt by premature ripening, a feature not present in 1935, and apparently one which may not become manifest until severe leaf spotting has been prevalent for some time. The evidence indicates that the leaves can become infected only when or soon after they unroll, this being followed by a fairly long incubation period, with the result that the development of spotting is observable only in the older leaves. The distribution of the spots on the leaf surface indicates that in some instances, at least, a definite relationship exists between intensity of spotting and adverse conditions of growth, particularly those affecting water supply. The most conspicuous symptom of premature fruit ripening is the pinkish pulp of the affected fingers. Some of the vascular strands of the true stem are pale blue, and contain vessels in which pathological symptoms have been or are being induced owing to the diseased state of the leaves. The occurrence of such changes in the true stem and rhizome may have an important effect on the progressive intensification of infection.

Garbowski (L.). **Poland : on the products used in the control of plant diseases and pests.**—*Int. Bull. Pl. Prot.*, xi, 4, p. 68, 1937.

The chemical composition of the fungicides, insecticides, and the like used in Poland is determined by analysis in the phytopathological department of the State Institute of Agriculture, Bygdoszcz, while their practical efficacy is ascertained by means of field tests at the same establishment and at the Institute of Rural Economy, Puławy, with the co-operation of local agricultural and horticultural experiment stations. The importation of certain anticryptogamic products is subject to customs regulations.

Robertson (W. C.). **Fungicides and insecticides. Brands registered for 1937.**—*J. Dep. Agric. Vict.*, xxxv, 4, pp. 195–207, 1 fig., 1937.

Following some explanatory notes a complete list is given of the fungicides, insecticides, and kindred preparations registered at the Office of the Director of Agriculture, Victoria, under the Fungicides Act, 1935 for the year 1937–8, with the percentages of declared active constituents and the names and addresses of the manufacturers or wholesale dealers supplying them.

Anderson (H. W.), Kadow (K. J.), & Hopperstead (S. L.). **The evaluation of some cuprous oxides recommended as seed-treatment products for the control of damping off.**—*Phytopathology*, xxvii, 4, pp. 575–587, 4 figs., 1937.

In these tests to determine the relative merits as seed disinfectants for the control of damping-off (*Pythium* and *Rhizoctonia* spp.) of five brands of cuprous oxide [*R.A.M.*, xvi, p. 549], adequate commercial

reduction of infection in a number of vegetable crops, including lettuce, carrots, beets, peas, onions, various cucurbits, tomato, eggplant, pepper [*Capsicum annuum*], and spinach was obtained with the preparations supplied by Röhm and Haas (cuprocide), Metals Refining Co. (metrox), Mallinckrodt, and Merck, the two first-named being the most effective. A product furnished by the Ansbacher-Siegle Co. was less generally satisfactory, probably on account of the low percentage (25) of active ingredient, whereas the others consisted essentially of pure cuprous oxide. The main points to be considered in the choice of a cuprous oxide are its capacity to afford a smooth uniform coverage to the seed and a high copper content (not less than 95 per cent.). Colour is not a reliable guide to the efficacy or otherwise of a preparation. The material should be fine enough to pass a 325-mesh screen. Under Illinois conditions crucifer seeds should not be treated with copper preparations, which are almost certain to cause injury. Cuprous oxide should not be used in soils more acid than $P_H$ 5. A number of other recommendations and precautions in connexion with the use of the compound are given.

Willaume (F.) & Binder (O.). **Sur les spectres d'absorption par réflexion dans l'ultraviolet de quelques sels basiques de cuivre et autres produits fongicides et insecticides.** [On the spectra of absorption by reflexion in the ultra-violet of some basic salts of copper and other fungicidal and insecticidal products.]—*C.R. Acad. Sci., Paris*, cciv, 18, pp. 1363–1365, 1937.

Samples of copper-containing preparations used as fungicides and insecticides were exposed for five minutes to the rays of a Challonge and Lambray hydrogen tube (2,000 volts, 4 milliampères) emitting wave-lengths up to 2,500 Å. The light from the source was reflected on the experimental substances by a mirror and the spectra registered on Lumière S.E. plates. The wave-lengths recorded for Bordeaux and Burgundy mixtures were 4,080 and 4,100 A, respectively, no difference being observed between the deposits of Bordeaux samples prepared in various ways.

Dufrénoy (J.) & Reed (H. S.). **A technic for staining cells with Sudan III in a water phase.**—*Stain Tech.*, xii, 2, pp. 71–72, 1937.

For the study of the spherical inclusions of lipoid material in the plant cell vacuole which constitute one of the most important indices of impaired physiological activities, the following stain was found to be satisfactory. A strong solution of Sudan III was first prepared in 5 c.c. methylal and the mixture poured into a small vial to which was added 10 to 20 c.c. water. After a few minutes the water and methylal separate, leaving the lower, light orange phase containing water+methylal+Sudan III and an upper phase consisting of methylal+Sudan III+water; the aqueous phase is able to carry the Sudan III into the cell without previous killing.

Spherical inclusions of highly refringent phytosterol material have been shown to occur in the hypoplastic cells of orange leaves affected by mottle leaf [*R.A.M.*, xiv, p. 506, and above, p. 605], and similar bodies have been observed in the cells of various Solanaceae and Compositae harbouring the spotted wilt virus [ibid., xvi, p. 285]. Such

bodies, besides staining with Sudan III and other fat-soluble dyes, react by a grey coloration to osmic acid at a low concentration, and by a blue one to nascent indophenol blue, formed as a suspension in a mixture of alkaline solutions of paradiphenylanine hydrochloride and thymol. Using the procedure described above, the writers obtained very satisfactory results with sections of *Callistephus sinensis* leaves affected by spotted wilt, the intravacuolar lipoid spheres having assumed a bright orange tint at the end of 30 minutes' exposure to the stain.

Raper (J. R.). **A method of freeing fungi from bacterial contamination.**—*Science*, N.S., lxxxv, 2205, p. 342, 1 diag., 1937.

Water mould cultures have been freed from their bacterial contaminants by the following method. A van Tieghem ring, to one end of which are fused three glass beads, $\frac{1}{3}$ to $\frac{1}{2}$ mm. in diameter, is placed in a Petri dish with the beaded rim resting on the bottom. Sufficient nutrient agar is poured into the dish to bring the surface of the medium well up on the ring. On the solidification of the agar a fragment of inoculum is transferred to the area enclosed by the ring. As growth progresses some of the hyphae extend down into the agar, under the ring, and into the agar lying beyond it, while the contaminants are retained at the surface of the semi-solid within the ring. Cubes of agar containing numerous hyphal tips from this outlying portion of the mycelium are therefore bacterium-free and may be used as a foundation for new and perfectly pure cultures.

Ferdinandsen (C.) & Buchwald (N. F.). **Fysiogene plantesygdomme. II. Kemoser.** [Physiogenic plant diseases. II. Chemoses.]—K. vet. Højsk., Kbh., 214 pp., 1936. [Received May, 1937.]

This is a comprehensive discussion, supplemented by copious references to the relevant literature, of the pathological effects on plants of such chemical factors as the excess or deficiency of water, carbon, oxygen, hydrogen, sulphur, phosphorus, potassium, calcium, magnesium, iron, manganese, copper, zinc, boron, and minor elements, industrial smoke, noxious gases, and miscellaneous factory emanations, the toxic constituents of insecticides and fungicides, soil poisoning, e.g., by salt, irrigation, and effluent waters, smoke, gas, toxic compounds in fertilizers and herbicides, metabolic processes, and 'exhaustion' due to fungi, bacteria, virus diseases, shortage of essential nutrients, and other cases.

Munn (M. T.). **Seed inspection for disease control.**—*Plant Dis. Reptr*, xxi, 7, pp. 121–124, 193[illegible] [Mimeographed.]

Discussing the methods of [illegible]ed testing for the detection of disease employed by the International Seed Testing Association, the writer finds that insufficient stress is laid on the sanitary condition of the material submitted for inspection and certification. Provision should be made for adequate field inspection, controlled handling of the seed crop, and careful testing by approved means of the finished seed stock, followed either by the issue of a certificate vouching for the apparent absence of seed-borne infection, or if the latter be present, by directions for appropriate treatment. Evidence accumulated during the last few

months indicates that growers are becoming increasingly alive to the need for large-scale seed disinfection [cf. *R.A.M.*, xvi, p. 443], and this welcome trend should be encouraged by the active co-operation of plant pathologists in the work of the seed-testing laboratories. In conclusion, a wider demand for international certificates [cf. ibid., xv, p. 688] is urged as conferring a measure of protection against the spread of disease and serving to focus attention on the importance of sound seed stocks.

AINSWORTH (C. G.). **The plant diseases of Great Britain : a bibliography.** —xii+273 pp., London, Chapman & Hall, Ltd., 1937. 15s. net.

The author has collected, and here presents in the form of an annotated list, the key references in the relevant English and foreign literature to the principal economic plant diseases of Great Britain, with a view to facilitating the rapid assembly of the essential information concerning a given pathogen and its control. As Dr. E. J. Butler points out in his foreword, the previous lack of such a compilation was of considerable inconvenience to the working plant pathologists for whom the present volume is primarily intended. The diseases are listed by their common and scientific names under the main host groups—cereals, fodder and root crops, potato, pulse, vegetables, fruit, ornamentals, trees, and miscellaneous, and author, host, and parasite indexes are provided.

YARWOOD (C. E.). **The relation of light to the diurnal cycle of sporulation of certain downy mildews.**—*J. agric. Res.*, liv, 5, pp. 365–373, 1937.

The author states that microscopical studies carried out under field conditions in California in May, 1935, showed that on the leaves of hop plants infected with downy mildew (*Pseudoperonospora humuli*) the sporangiophores first emerged from the stomata at 12 p.m.; at 3 a.m. the branching of the sporangiophores was complete, and small sporangia had formed; these attained about full size at 6 a.m., and were mature and readily liberated at 9 a.m., at which time they were caught in the largest numbers on spore-trap slides; very few sporangia were caught at night. Experiments further showed that the downy mildews of hop, onion (*Peronospora destructor*) [*P. schleideniana*: *R.A.M.*, xv, p. 468], vine (*Plasmopara viticola*), and lettuce (*Bremia lactucae*) failed to sporulate when infected leaves were exposed to artificial light (170 ft. candles from a Mazda lamp). The hop and onion mildews sporulated most abundantly when infected leaves or plants were placed in darkened moist chambers in the late afternoon and evening, and poorly, or not at all, when the leaves or plants were placed in these chambers in the early morning. Exposure for 12 hours or more to darkness at low humidity and different temperatures also inhibited the capacity to sporulate of the hop and onion mildews, but subsequent exposure to natural or artificial light for 12 hours restored it. These findings are considered to indicate that while the diurnal cycle of sporulation of these two mildews is basically dependent on the alternation of light and darkness in the normal day, the actual nocturnal sporulation is directly

dependent on the darkness and high humidity frequently coincident at night [cf. ibid., xvi, p. 104].

Salaman (R. N.). **Plant viruses and their relation to those affecting man and animal.**—*Lancet*, ccxxxii, 5927, pp. 827–833, 1 diag., 1937.

In this interesting and suggestive account (delivered as a lecture before the Southampton Medical Society on 13th January, 1937) of some outstanding recent contributions to the study of viruses [*R.A.M.*, xvi, p. 114], the writer discusses the relationships between those attacking man and animals and the plant group. The paper falls into three main sections: (1) the nature of viruses, comprising observations on the definition, character, size, properties, and variations of the infective principles, and the antigenic and protective reactions of the host towards the invader; (2) reaction to infection, including remarks on the carrier, transference of plant viruses, virus complexes, and typical diseases; and (3) prevention, briefly outlining a few possible lines of approach to the control problem (in plants, more especially potatoes), e.g., cultivation of (*a*) naturally immune varieties and (*b*) carriers, good husbandry, and vaccination.

Savile (D. B. O.) & Racicot (H. N.). **Bacterial wilt and rot of Potatoes.**—*Sci. Agric.*, xvii, 8, pp. 518–522, 3 figs., 1937. [French summary.]

Since 1931 potatoes in several localities in Quebec have shown a condition referred to as 'bacterial wilt and rot' affecting both haulm and tubers [*R.A.M.*, xvi, p. 201]. In the greenhouse the first symptom may be a flagging of individual leaflets during sunny periods. Later the affected leaves may show an upward rolling of the edges, or lesions with yellow margins, finally becoming permanently wilted and shrivelled. The petioles of mature leaves generally remain rigid, but the young petioles and the stem tip may wilt before shrivelling. In the field the symptoms are less conspicuous. Affected tubers display a yellowish or light brown discoloration of the vascular ring spreading from the stolon end, and subsequently there may be a more extensive dark discoloration, general rot, and a separation of the cortex and outer storage parenchyma from the storage parenchyma inside the xylem ring. The affected tissues are crumbly, with the consistency of cooked potato tissue. Slightly affected tubers usually show no external symptoms, but severely affected ones may be cracked or bear reddish-brown discolorations on the skin. Some tubers decay completely, and others continue to show faint symptoms in the spring.

From the vascular ring of slightly affected tubers colonies of a very slow-growing, Gram-positive rod-shaped bacterium measuring about 0·6 to 0·9 by 0·3 to 0·5 $\mu$ were obtained, and inoculations with it into potato stems and tubers reproduced the disease. The organism is very closely related to *Phytomonas michiganensis* [*Aplanobacter michiganense*: ibid., xvi, p. 419] and *Bacterium sepedonicum* [ibid., xv, p. 251], but it is doubtful whether it can be considered identical with either. Inoculations into tomato stems resulted in symptoms closely resembling those of *A. michiganense*.

Littauer (F.). **Phytophthora blight of Potatoes.**—*Yedeoth*, iii, 3–4, pp. 84–93, 4 figs., 1937. [Hebrew, with English summary.]

Potato blight (*Phytophthora infestans*), rare during the first years of cultivation in Palestine, has continued to spread since its first appearance, and has assumed an epidemic character in some localities. The increased importation of potatoes adds to the danger of an outbreak, and spread is also favoured by the fact that the area under potatoes is extended during winter and spring, which are the seasons most conducive to the development of the fungus. Tuber infection is found only on imported seed tubers, the disease in its local form attacking only the stems and leaves.

Investigations showed that no disease occurred at temperatures of 25° to 26° C., the optimum being between 13° and 24°. Sudden variations within the optimum range are particularly favourable to the development of the fungus, with the result that spread is most marked during periods with cold nights and warm, humid days [*R.A.M.*, xvi, p. 514]. The fungus was found only in February, March, and the first half of April, after which time spread is arrested by the rising temperature and the hot, dry winds. Potatoes sown between August and October, inclusive, have not yet been affected.

Van der Plank (J. C.). **Internal brown fleck; a phosphorus-deficiency disease of Potatoes grown on acid soils.**—*Sci. Bull. Dep. Agric. S. Afr.* 156, 22 pp., 4 pl., 1 fig., 1936. [Received July, 1937.]

In the form of internal brown fleck of potatoes that occurs in South Africa [*R.A.M.*, iii, p. 603; iv, p. 564] as a result of phosphorus deficiency in the soil, associated with high acidity, the affected tubers show isolated, rusty-brown lesions, up to over 1 cm. in diameter, which may coalesce, and occur in the cortex and pith, sometimes crossing the vascular ring. They are arranged irregularly, though sometimes with a tendency to a radial pattern. Externally the potatoes appear to be normal. The lesions are initiated by the lignification and death of isolated cells, followed by collapse of the surrounding tissue, which is not isolated by a ring of cork.

The disease causes considerable loss and has been observed in all four Provinces of the Union, under different conditions of climate and rainfall, though perhaps most prevalent on the high veld. It is regarded as distinct from similar conditions reported from other countries, as these are not attributed to the same soil factors, though the rusty spot reported from Java [ibid., xv, p. 253] may possibly be an exception, but tubers showing an anatomically similar appearance were received from Southern Rhodesia, Portuguese East Africa, and the Belgian Congo. Slightly flecked tubers may safely be used as seed, but badly affected ones should not be planted, as they are too weak.

Control may be effected by the combined use of lime and superphosphate, the liming being carried out as early as possible before planting. Soils in which the disease is very severe should be avoided.

Dykstra (T. P.). **Report on Potato virus diseases in 1936.**—*Amer. Potato J.*, xiv, 4, pp. 117–124, 1937.

This is a brief summary and bibliography of the principal papers

appearing in 1935–6 on virus diseases of potatoes [cf. *R.A.M.*, xv, p. 246].

Bald (J. G.). **An F-type Potato virus in Australia.**—*Nature, Lond.*, cxxxix, 3520, p. 674, 1937.

In January, 1936, a virus carried without symptoms in a number of Solanaceous hosts was recovered from Arran Crest or Arran Pilot potatoes with a slight aucuba foliar mottling at Canberra. No tuber necrosis was observed, but the virus was repeatedly recovered over a period of one year from the tubers of the affected plants, and from $F_2$ plants grown from them. The presence of the virus failed to protect the plants from infection by Y-type viruses, and various other hosts containing it readily succumbed to X and X+B. Severe necrosis was induced by the potato virus on pepper [*Capsicum annuum*] at 70° F., above and below which the symptoms were milder. *Solanum nigrum* sometimes showed a very faint and transitory vein-clearing or mottle, but usually contained the virus in large quantities without the expression of any external symptoms. The properties of the virus, as far as hitherto studied, correspond with those of the F type [*R.A.M.*, xvi, p. 116].

Schultz (E. S.), Clark (C. F.), Stevenson (F. J.), & Raleigh (W. P.). **Resistance of the Potato to latent mosaic.**—*Amer. Potato J.*, xiv, 4, pp. 124–127, 1937.

The tendency to aerial tuber formation detected by Raleigh in Green Mountain scions containing the latent mosaic virus [*R.A.M.*, xvi, pp. 53, 487], served to determine the reactions to this disease of 203 seedlings of the cross S41956×Katahdin and 135 of S41956×S45075. The data were obtained by inarch grafting of a shoot from each of three seedling tubers on a latent mosaic Green Mountain shoot when the plants were about 15 cm. in height. Some ten days after grafting, the seedling shoots in two of the grafts were cut off above and next to the graft union, so as to leave a latent mosaic top on the seedling stock. The seedling shoots in the third graft were not severed, so that foliage reactions could be observed. Inarched grafts of Katahdin, and of the seedling varieties S41956 and S45075 used as parents, were made on latent mosaic Green Mountain for control purposes. The results were as follows: S41956×Katahdin, 37 per cent. immune, 23 per cent. necrotic, 16 per cent. mottled, and 24 per cent. apparently healthy; S41956×S45075, 37 per cent. immune, 0 per cent. necrotic, 36 per cent. mottled, and 27 per cent. apparently healthy. Sap inoculations from the externally sound progenies of the two crosses on *Datura stramonium* and *Capsicum* sp. showed that the apparently healthy plants carried the latent mosaic virus. The fact that no necrosis developed in the progeny of S41956×S45075 is taken to denote that the latter differs genetically in this respect from Katahdin, 2[illegible] per cent. of the offspring of which and S41956 contracted the typical necrotic reactions of Katahdin. Of the controls, all the Katahdin shoots developed top necrosis; one S45075 shoot produced light green foliage and three remained apparently healthy, but were shown by inoculations on *D. stramonium* to harbour the latent mosaic virus. The seedling variety S41956 was immune, as

indicated by the aerial tuber reaction in the latent mosaic Green Mountain scion.

VOLKART (A.). **Sortenwahl und Saatguterzeugung im Kartoffelbau.** [Varietal selection and seed production in Potato cultivation.]—*Schweiz. landw. Mh.*, xv, 1, pp. 2–27, 3 figs., 2 diags., 7 graphs, 1937.

The writer fully describes and discusses the commercial, economic, and scientific aspects of seed potato production in Switzerland, in connexion with which the importance is emphasized of replacing varieties susceptible to wart [*Synchytrium endobioticum*] by immune sorts [*R.A.M.*, xvi, p. 403] and the constant replenishment of seed from mountain-grown stocks to eliminate virus infections [ibid., xiv, p. 786]. From 1940 onwards, by a decision of the (German) Reich Food Board, the cultivation of the wart-susceptible Industrie, Allerfrüheste Gelbe, Centifolia, Duke of York, Early Rose, Wohltmann, and Zwickau, is to be discontinued, the development of suitable indigenous substitutes for which is therefore becoming urgently necessary. There has been a tendency of late years, which is strongly to be deprecated, to include susceptible varieties in the standard Swiss assortment, the only immune ones at the moment being Kaiserkrone (early), Erdgold and Weltwunder (medium-early), Voran (late), and Ackersegen and Jubel (industrial); the last-named, also resistant to scab [*Actinomyces scabies*] and *Phytophthora* [*infestans*], could well be used to replace Centifolia for the table.

[BLAIR (I. D.).] **Deterioration in the Potato.**—*Bull. Canterbury agric. Coll., Lincoln*, 94, 2 pp., 1937.

Degeneration in potatoes in New Zealand is mainly due to virus diseases, including leaf roll, mosaic, crinkle, and stipple streak [*R.A.M.*, xvi, p. 552], but also to *Verticillium albo-atrum*, *Erwinia atroseptica*, and *Bacterium solanacearum*. *Actinomyces* [*scabies*], *Spongospora subterranea*, and *Corticium solani* may so disfigure the tubers as to render them unmarketable. Dry rot (*Fusarium* spp.) [*F. orthoceras* and an unidentified *F.* species: ibid., xiv, p. 466] is a major problem in New Zealand, but its incidence can be reduced by the avoidance of mechanical injury during digging, grading, and transit, and of contamination from diseased tubers in the sheds. Owing to the masking of virus symptoms in some varieties high quality seed can be maintained only by growing different varieties some distance apart. Transmission often occurs through *Solanum nigrum*. No commercial varieties are resistant to both leaf roll and mosaic; Iron Duke may carry high resistance to mosaic, but is extremely susceptible to leaf roll.

The certification of seed potatoes by the New Zealand Department of Agriculture [ibid., vii, p. 389; xv, p. 44] is restricted to disease-free seed. Two standards of certified seed are available, commercial and mother seed, of which the former is ineligible for re-entry into certification, while the latter, which commercial growers of certified seed are required to purchase, includes only the best lines.

The prevention of potato degeneration depends on disease control, and this in turn on crop rotation, proper handling, and the use of certified seed.

Tochinai (Y.) & Sakamoto (M.). **Studies on the physiologic specialization in Ophiobolus miyabeanus Ito et Kuribayashi.**—*J. Fac. Agric. Hokkaido Univ.*, xli, 1, pp. 1–96, 3 pl., 2 figs., 1 diag., 1937.

An exhaustive, fully tabulated account is given of the writers' studies on physiologic specialization in *Ophiobolus miyabeanus* [*R.A.M.*, xvi, p. 490], one of the most destructive pathogens of rice in Japan.

Monospore cultures of 132 strains of the fungus were grown on four differential media, viz., rice culm decoction, potato decoction, Saito's soy, and Richards's nutrient agars. The optimum temperature for development was found to range from 25° to 30° C. on Saito's soy agar. Saltation, both of the sector and patch types, was of frequent occurrence in several strains. In some cases the characters of the saltants persisted in the progeny through ten generations of reculture; whereas in others complete reversion to the parent forms took place. Morphological variations in the shape of the conidia were observed among the strains on rice culm decoction agar, stout types ($94{\cdot}36 \pm 0{\cdot}66$ by $18{\cdot}59 \pm 0{\cdot}09\ \mu$) being produced by biologic races I, II, and III, and slender ones ($91{\cdot}00 \pm 0{\cdot}63$ by $17{\cdot}00 \pm 0{\cdot}10\ \mu$) by IV. These distinctions were not apparent on potato decoction agar.

In inoculation experiments representatives of the ten growth types into which the 132 strains were classified differed in their pathogenicity to 15 rice varieties, some biologic races being extremely virulent, others only moderately or weakly so. The Omachi No. 2, Tokachi-kuroke, Sensho, Kamenoo, Bozu No. 5, and Kairyo-shinriki varieties were resistant, while Hashiri-bozu and Kairyomochi No. 1 proved very susceptible to most strains of *O. miyabeanus*. Races VIII and X did not attack cereals, the remaining eight caused more or less severe infection of maize and naked barley, while wheat, common barley, rye, and oats were comparatively resistant.

A bibliography of 64 titles is appended.

Teodoro (N. G.). **An enumeration of Philippine fungi.**—*Tech. Bull. Philipp. Dep. Agric.* 4, 585 pp., 1937.

This is an annotated list of all known Philippine fungi and references to species credited to the Archipelago in publications appearing prior to January, 1935 [cf. *R.A.M.*, ii, p. 141; vi, p. 365; xi, p. 268; xvi, p. 209].

Maublanc (A.). **Contribution à la connaissance de la flore mycologique du littoral Atlantique.** [A contribution to the knowledge of the mycological flora of the Atlantic seaboard.]—*Rev. Path. vég.*, xxiv, 2, pp. 121–132, 2 figs., 1[illegible].

In this annotated list of Peronosporales, Ustilaginales, and Uredinales collected by the author on the French Atlantic seaboard mention is made of *Puccinia porri* [*R.A.M.*, xv, p. 745] found on leeks.

Homma (Yasu). **Erysiphaceae of Japan.**—*J. Fac. Agric. Hokkaido Univ.*, xxxviii, 3, pp. 183–461, 8 pl., 7 figs., 1937.

In the first part of this monograph dealing with all the Japanese species of Erysiphaceae the author gives the results of her biological and morphological studies on these fungi.

From the evidence obtained it is concluded that in all the genera of the Erysiphaceae the conidia are produced in a chain, though in *Uncinula*, *Microsphaera*, *Erysiphe* (*Polygoni* section), *Phyllactinia*, *Uncinulopsis*, and *Leveillula* two or three immature conidia are always present beneath a single mature spore. *Cystotheca* is considered to show the most simply constructed perithecium, while *Uncinulopsis* and *Phyllactinia* have the most complex.

When the conidia of *E. graminis* f. sp. *tritici* [*R.A.M.*, viii, p. 433; xiv, p. 711] were inoculated on wheat varieties immune from and susceptible to the fungus the infection tube penetrated into the cell wall of the epidermis in all the varieties, but haustoria were formed only in the susceptible ones. Inoculations of wheat in different stages of growth with the conidia showed that infection did not take place either in the early growing or late senile stages, that mycelial growth was most vigorous in the mature stage, and that perithecia generally formed in the early senile stage. *Triticum dicoccum*, Emmer 3933, Khapli 6400, *T. boatum*, and Russian No. 38 were immune from *E. graminis* f. sp. *tritici* collected in an experimental field; of other wheat varieties tested the susceptible were distinguished from the resistant by different morphological leaf characters, highly susceptible varieties showing few hairs on the surface and few thick-walled epidermal cells, and resistant varieties the opposite. As a result of a series of inoculation experiments with *E. graminis*, the author concludes that the existence of a bridging form in this mildew must be recognized, *Triticum dicoccum* var. *farrum* being the bridging species between *T. vulgare* and *T. monococcum* var. *hornemanni*. The conidia on *T. vulgare* are longer and form longer and more slender germ-tubes than those on *T. dicoccum* var. *farrum*.

In the second part of this paper annotated diagnoses are given of 74 powdery mildews belonging to 11 genera found in Japan. Among the new species recorded are *Uncinula bifurcata* on oats, *U. betulae* on birch, *Sawadaea negundinis* on *Acer negundo*, *Microsphaera ligustri* on *Ligustrum ovalifolium*, and *M. coryli* on *Corylus*. *Erysiphe pyri* on pear is renamed *Phyllactinia pyri* (syn. *P. suffulta* f. *pyri* Rehm).

Dahnke (W.). **2. Nachtrag zur Flora von Parchim und Umgebung** [Second addendum to the flora of Parchim and environs.]—*Arch. Ver. Naturg. Mecklenb.*, N.F., x (*1935*), pp. 17–34, 1936. [Received June, 1937.]

The following are among the fungi observed by the writer in the Parchim district of Mecklenburg in 1935: *Entyloma calendulae* prevalent on *Calendula officinalis* [*R.A.M.*, xvi, p. 515], *Cronartium ribicola* on black currant [ibid., xiv, p. 617], *Endophyllum sempervivi* on *Sempervivum tectorum* [ibid., xv, p. 510], *Fomes fomentarius* on beech [ibid., xv, p. 473; cf. also xvi, p. 4], and *F. nigricans* on *Salix*.

Sprague (R.). **Undescribed species of Cercosporella and Cercospora on certain grasses in Oregon and Washington.**—*Mycologia*, xxix, 2, pp. 199–206, 3 figs., 1937.

Notes, with Latin diagnoses, are given on three new species of *Cercospora*-like fungi found on grasses in the United States, viz., *Cercosporella holci* n. sp. (alternatively *Cercospora holci* n. sp. if the genus

*Cercosporella* is not recognized) on *Holcus lanatus* in the field, *Cercosporella subulata* n. sp. (*Cercospora subulata* n. sp.) on herbarium material of *Melica subulata* (Griseb.) Schribn., and *Cercospora bromi* n. sp. (*Cercosporina bromi* n. sp.) on *Bromus rigidus* Roth in the field.

Drechsler (C.). **New Zoopagaceae destructive to soil rhizopods.**—*Mycologia*, xxix, 2, pp. 229–249, 6 figs., 1937.

Full descriptions, with Latin and English diagnoses, are given of three new species of *Cochlonema* and one of *Zoopage* predacious on soil rhizopods in the United States [*R.A.M.*, xvi, p. 176], viz., *C. odontosperma* n. sp., occurring in leaf mould, infecting and consuming amoebae, *C. megaspirema* n. sp., occurring as a destructive parasite of *Amoeba terricola* (sensu strictiore) in partly buried, decaying tomato leaves, *Z. tryphera* n. sp., occurring in leaf mould, capturing and consuming *Geococcus vulgaris*, and *C. cylindricum* n. sp., parasitic on *Euglypha denticulata*, and occurring in decaying tomato roots.

Heubel (G. A.). **Beknopt overzicht van de Rubber- en Theecultuur in het rayon Buitenzorg gedurende 1936.** [A condensed survey of Rubber and Tea cultivation in the Buitenzorg area during 1936.] —*Bergcultures*, xi, 14, pp. 475–480, 1937.

*Ganoderma pseudoferreum* was responsible for the chief damage to *Hevea* rubber roots in the Buitenzorg district of Java [*R.A.M.*, xi, p. 72; xiii, p. 687] in 1936. The best method of arresting the spread of infection is to expose the root-collars of trees in threatened areas. *Phytophthora palmivora* [ibid., xv, p. 345] was prevalent, and *Corticium salmonicolor* [ibid., xiv, p. 152] occurred in a widespread and serious form. *Diplodia* and *Ustulina zonata* [ibid., xiii, p. 56] caused damage among grafts. A mixture of milk of lime and 3 per cent. izal or 5 to 10 per cent. carbolineum plantarium has been found useful in the prevention of infection of the tapping surface, but if wounds are present or *P. palmivora* develops in a severe form, a combination of Product Socony 2295 A and 3 per cent. carbolineum plantarium exerts a strong curative action.

*G. pseudoferreum* was again in evidence in tea plantations [ibid., xii, p. 278], where its extension may be curtailed by exposing the root-collars of the healthy bushes adjoining the circular trench surrounding an infection focus. It is of great importance to keep the trench intact to prevent the passage of infection to the healthy sites outside. Pruning in infected gardens is another source of fresh outbreaks of red root.

Gadd (C. H.). **The treatment of Poria root disease of Tea.**—*Tea Quart.*, x, 1, pp. 36–45, 4 diags., 1937.

Examples are given of the application of an improved method for the control of the root disease of tea caused by *Poria hypolateritia* [*R.A.M.*, xv, p. 747; xvi, p. 129] based on the removal of every diseased bush. As most of these appear to be healthy above ground a ring of healthy bushes is removed as well. The soil is cleared of all roots and woody material, and diseased parts are carried away in closed sacks. Trenching is uneconomical, as all the bushes in the enclosed area become infected and die, and meantime the trenches require to be maintained

in perfect order, and the replanting of the diseased area is delayed. Trenches should be regarded as only a second line of defence. Locally, they are very inefficient, and could be safely abandoned if every affected bush were removed.

One area in which the disease is believed to have been eradicated by the new method lies at the edge of a ravine where infected bushes have previously been burnt. In August, 1935, one dead and two sickly bushes and eleven vacancies, each with a diseased tea stump, were found, all of which were removed. Surrounding bushes were uprooted until every diseased bush and a whole ring of healthy ones had been dug out. The entire area was then replanted with *Tephrosia vogelii*. In June, 1936, a few of these plants were found to be dead, with *P. hypolateritia* on the roots. These were removed, the source of infection being discovered in a few tea roots that had been overlooked. The plot is to be planted with tea next year.

GADD (C. H.). **Report of the Mycologist for 1936.**—*Bull. Tea Res. Inst. Ceylon*, 17, pp. 23–30, 1937.

This report contains the following items of interest apart from those already noticed from other sources [see preceding abstract]. During 1936, there was a marked increase in the number of tea bushes in Ceylon reported as killed off by brown root rot (*Fomes noxius*) [*R.A.M.*, xv, p. 610; xvi, p. 129]. Where shade trees, particularly *Grevillea*, are felled in large numbers, there is considerable risk that the disease may develop. On one estate where about 6,000 healthy *Grevillea* trees had been cut down, brown root rot began to appear two years later, and over 3,000 bushes had to be removed. Owing to the great rapidity with which *F. noxius* infects the shade stumps and passes to the tea, the former should be eradicated immediately after felling.

Extensive spread of *Rosellinia arcuata* [loc. cit.] occurred on an estate where the soil surface was covered by a thick layer of fallen leaves, and as the fungus can grow freely through leaf mould, the ground at the perimeter of any treated area must be kept free from leaves. There is small danger of the fungus spreading through the mulch in dry weather, but in the wet season the mulch should be kept away from the main stems of tea bushes on estates where the disease occurs.

A new tea disease referred to as 'phloem necrosis' has occurred in one locality; the affected bushes are dwarfed and non-yielding, and have small, hard, distorted leaves, those at the ends of the branches being crowded together. In advanced stages the bushes bear only a few thin branches, which also have small, distorted leaves. In cross section the leaves are V-shaped (though some types of healthy bushes show this character); they are also arched backwards, and sometimes so conspicuously curled that affected bushes can be recognized from a distance. The bushes with markedly curled leaves have longer internodes than others. Recovery from pruning is often poor. As a rule no marked yellowing of the leaves is present. The most conspicuous symptom is the presence of yellow-brown or dark brown spots seen when the woody roots, which outwardly appear normal, are sliced through the cortex so that the cut passes very close to the cambium or just touches the wood. The cause of the disease has not yet been ascertained.

Another type of non-productivity is polyclady, characterized by a prolific development of small, whippy branches from below the ground. The bushes appear like very compact tufts, the leaves are small and hard, and the branches wiry and very close together. There is little indication of a main frame, and the roots turn upwards and give rise to numerous branches. Many form upright, wiry stems, but others remain underground as white, spiral stems. No explanation of the condition is at present available; some affected bushes also show phloem necrosis.

The fungus previously reported as causing a leaf spot of *Crotalaria* [*anagyroides* and *C. usaramoensis*: ibid., xv, p. 747] was identified as *Ceratophorum setosum* [ibid., xvi, p. 515]. Inoculation tests showed that the Ceylon strain attacks *Lupinus polyphyllus* as readily as the European strain, the two strains also giving similar results when inoculated on to the leaves of *C. usaramoensis*.

*Tephrosia radicans* was severely attacked by *Cercosporella theae* [ibid., xiii, p. 216], the conidia of which were ascertained to attack tea flush as readily as those of the tea and acacia strains. The *T. radicans* stems showed perithecia of a species of *Calonectria* similar to that previously reported in pure cultures of *Cercosporella theae* from tea leaf; similar perithecia were obtained in pure cultures of *C. theae* from *T. radicans*.

Berkeley (G. H.). **Prevention of Tobacco mosaic in Ontario.**—*Circ. Dep. Agric. Can.* 119, 7 pp., 7 figs., 1937.

The following are among the practices recommended for the control of tobacco mosaic in Ontario [*R.A.M.*, vii, p. 347]. Seed-beds should be steam-sterilized, the operation being continued for at least 30 minutes after a temperature of 150° to 212° F. is reached at the lowest depth required. Old boards should be disinfected either by ten minutes' exposure to steam or sprayed with a 2 per cent. solution of formalin and covered with wet papers or canvas for 24 hours, and old cloths boiled for ten minutes. On no account must mosaic seedlings be transplanted to the field, where the percentage of infection may increase from 1 to 80 by harvest time through cultural operations. Experimental results at Delhi (Ontario) have shown that up to 30 per cent. mosaic may develop in the field through the use of tobacco in any form by workers during transplanting. Crop rotation is indicated, experiments at Delhi in 1935–6 having shown that 28 and 17 per cent. mosaic, respectively, occurred in tobacco crops following tobacco, compared with only 1 per cent. in those planted on new ground or following rye [ibid., xvi, p. 500]. Similar results were obtained at St. Catharines, where 10 per cent. mosaic developed on tobacco following tobacco and only 1·5 per cent. on new ground. The importance of roguing is apparent from recent observations at Delhi, where the spread of mosaic in 1935 in a block in which all the diseased plants were rogued before cultivating amounted to only 2·5 per cent., compared with 16 per cent. in an untreated plot. In 1936, in a plot containing 2 per cent. mosaic rogued before the first two cultivations only there was an increase of 2·5 per cent., as against 23 per cent. in an untreated control plot. Plants should not be re-set in soil from which mosaic plants have recently been rogued; 36 per cent.

of healthy plants so treated contracted the disease at Delhi in 1935. In topping, suckering, &c., all healthy plants should be treated as a separate group, leaving the diseased material until later. At Delhi in 1936, in an uncultivated plot with 2 per cent. mosaic in which all healthy plants were topped first, the incidence of infection increased by only 7·6 per cent., whereas in a similar plot where the operation was performed at random, there was an increase of 21·4 per cent. At St. Catharines in 1936 the amount of disease increased by 17·5 per cent. in a plot where the healthy plants were topped first and by 28·2 per cent. where indiscriminate treatment was practised. Implements contaminated by use in a mosaic plot were experimentally shown at Delhi to cause up to 50 per cent. infection in a healthy plot.

Berkeley (G. H.). **Tobacco diseases in Canada.**—*Plant Dis. Reptr*, xxi, 7, p. 112, 1937. [Mimeographed.]

During the last two years three seedling diseases new to Canada have been discovered by [L. W.] Koch, namely, black leg [*Erwinia aroidea*: *R.A.M.*, xvi, p. 214], frenching [ibid., xvi, p. 412], and root knot [*Heterodera marioni*]; while another, a brown root rot apparently new to science, is prevalent in steamed plant beds, where it is characterized by stunting and general chlorosis.

Other seed-bed disorders were black root rot [*Thielaviopsis basicola*: ibid., xv, pp. 178, 449; cf. also xvi, pp. 130, 348, *et passim*], damping-off [*Pythium* and *Rhizoctonia* spp. including *R.* [*Corticium*] *solani*: ibid., xv, p. 178; cf. also xvi, p. 412 *et passim*], chlorosis of obscure origin, and fleshy fungi (*Coprinus* spp.). In the field the incidence of mosaic [see preceding abstract] was generally lower in 1936 than in 1935, though up to 75 per cent. was recorded in individual fields. Brown root rot was severe only where tobacco followed timothy [*Phleum pratense*] or maize; the Harrow Velvet, Yellow Mammoth, and White Stem Willow Leaf varieties were the most susceptible to this disease, White Mammoth and Bonanza being resistant. *T. basicola* was most severe on Kelley, causing little damage to Harrow Velvet. Various physiological troubles, including sand drown [ibid., xii, p. 146] were reported from different localities. Angular leaf spot and wildfire [*Bacterium angulatum* and *Bact. tabacum*: ibid., xvi, p. 566] occurred in Quebec.

Caldwell (J.) & Smith (K. M.). **An air-borne plant virus.**—*Nature, Lond.*, cxxxix, 3522, pp. 761–762, 1937.

In the first of two notes under this title J. Caldwell questions whether K. M. Smith's 'air-borne' virus [tobacco necrosis: *R.A.M.*, xvi, p. 570] actually does reach the air from the tissues of a living infected plant, or that, having done so, it is capable of attacking normal healthy plants. In reply K. M. Smith states that infection of tobacco plants from the air has been experimentally proved under controlled conditions by spraying the virus into the surrounding air from an atomizer. Numerous lesions on French bean (*Phaseolus vulgaris*) leaves have further been induced by the same means. Whether the virus enters through broken hairs or minute wounds, such as are generally supposed to be essential to virus penetration, is not clear at the present stage of the investigations.

MacClement (W. D.). **An improved method of inoculating plants with virus for the study of local lesions.**—*Parasitology*, xxix, 2, pp. 266–272, 1 diag., 2 graphs, 1937.

An account is given of an investigation of the causes of error in estimating virus concentrations by the local lesion method. The inoculum used in the trials consisted of a 'green' strain of tobacco mosaic (Jensen's tobacco virus 1) isolated from Jensen's yellow tobacco mosaic [*R.A.M.*, xvi, p. 496] and the test plants were *Nicotiana glutinosa*. Discrepancies were found to arise through variations in (1) the response of (*a*) whole plants, (*b*) individual leaves; (2) the volume of liquid used; (3) the probability of the production of local lesions; and (4) the percentage of leaf hairs broken in inoculation. These irregularities may be reduced to a minimum by the use of an apparatus in which a small ground glass spatula is rotated against the leaf surface. The maximum number of local lesions is produced when the pressure of the spatula is adjusted so as to break all the leaf hairs near their bases without marking the epidermis. With this apparatus a very small amount of inoculum is required (0·001 c.c. for a spatula with a circular head $\frac{1}{2}$ in. in diameter), which is placed on the leaf by means of a 0·02 c.c. glass pipette. By this method up to 25 separate inoculations can be made on a large leaf, the average number being 12 so that an entire experiment can be conducted on one plant. The writer has found that, with this apparatus, experiments formerly requiring three months can be performed in three weeks, the variation in results being less than 10 to 20 per cent.

Stanley (W. M.). **Some biochemical investigations on the crystalline Tobacco-mosaic virus proteins.**—*Proc. Amer. phil. Soc.*, lxxvii, 4, pp. 447–453, 1 pl., 1937.

Some outstanding contributions to the knowledge of the nature and properties of the crystalline tobacco-mosaic virus proteins [*R.A.M.*, xvi, p. 569, and next abstract] are briefly summarized and discussed. Most of the work is of recent date and has been noticed from time to time in this *Review*.

Wyckoff (R. W. G.). **The ultracentrifugal study of virus proteins.**—*Proc. Amer. phil. Soc.*, lxxvii, 4, pp. 455–462, 3 pl., 1937.

An air ultra-centrifuge of a stable air turbine type with pendant rotors, as developed by Beams (*Rev. sci. Instr.*, vi, p. 299, 1935, *et passim*) from Svedberg's original design (*Naturwiss.*, xxii, p. 225, 1934), is stated to be affording valuable assistance to the writer and his collaborators in two branches of virus study—so far restricted to tobacco mosaic [*R.A.M.*, xvi, p. 346] but presumably capable of extension. In the first place, analytical runs with it, besides furnishing a measure of the size of the virus molecules (*c.* 35 $\mu\mu$), give indications of the degree of purity of a given preparation, the molecular weight of its impurities, its position as a single molecular species or as a part of a family of related proteins [see preceding abstract], and the like. Secondly, runs in which large volumes are ultra-centrifuged in fields sufficiently great to sediment any of the known viruses provide the basis for a method of preparing pure virus protein without recourse to chemical treatment, thereby

opening up the way to a study of viruses which, unlike that of tobacco mosaic, are relatively unstable or present only in minute quantities.

BEST (R. J.). **Visible mesomorphic fibres of Tobacco mosaic virus in juice from diseased plants.**—*Nature, Lond.*, cxxxix, 3519, pp. 628–629, 1 fig., 1937.

The author reports the direct observation, in the protein sediment deposited during several months' storage at about 1° C. in clarified juice from mosaic-diseased tobacco plants, of long fibres, the presence of which had been deduced by Bawden *et al.* in their recent communication on liquid crystalline substances from virus-infected plants [*R.A.M.*, xvi, p. 346]. When undisturbed, the fibres appeared to be several cm. long and fairly flexible, their individual width being of the order of 1 $\mu$; when mounted under cover slips, however, they usually broke up into fragments 2 to 5 mm. in length. With polarized light they suggested a terraced structure in one direction. Gentle agitation of the suspension reduced the fibres to the appearance of short, straight needles or rods, and violent shaking reduced the greater part to a state where they were no longer visible, but standing the suspension undisturbed after shaking reversed the process, the long, satin-like fibres being reconstituted at the bottom of the tube. Moderate dilution reduced the fibres to a state below visibility.

The fact that the fibre-containing protein deposit contained 97 per cent. of the infective principle, together with the fact that when the suspension was heated, the fibrous material at a temperature of just below 92° C. was abruptly changed to a clumped, coagulated mass which floated to the surface, this change being apparently irreversible and coinciding with the thermal inactivation point of tobacco mosaic virus, is considered to be strongly suggestive of the identity of the fibres with the infective principle, a view which is further supported by the fact that the fibres are not formed in the expressed juice of healthy plants stored under the same conditions. It seems a fair conclusion that these mesomorphic, flexible fibres consist of long chains of virus particles linked together by relatively feeble bonds.

GIGANTE (R.). **La laciniatura da virosi delle foglie di Pomodoro.** [Virus-caused laciniation of Tomato leaves.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 87–120, 1 pl., 18 figs., 1937.

The results are given of a histological and cytological study of tomato plants in Italy showing symptoms of fern-leaf [*R.A.M.*, xiv, p. 681; xv, p. 614, and next abstract], for which the author prefers the term 'virus-caused laciniation', as constriction of the leaf blade causing laciniation in the strict sense of the word was a constant symptom, whereas fern-leaf formation was not. Three types of enations were observed, viz. (1) verruciform, produced by hypertrophied epidermal cells, which may be arranged in two or three layers; (2) ridge-like excrescences consisting of a proliferation of subepidermal tissues covered with hypertrophied epidermal cells; and (3) lamellary enations, having the same anatomy as the leaves. The chloroplasts in affected leaves are sometimes smaller than normal. Intracellular (X) bodies, 6 to 13 $\mu$ in diameter, were present in close proximity to the nucleus, in the palisade and spongy

tissues of the leaves, and in the cortical parenchyma of the leaf stalks.

In artificial inoculation experiments the disease was transmitted from affected to healthy tomatoes by means of infected juice and grafting, and to White Burley tobacco by rubbing the leaves with infected tomato material. As the inoculations on tobacco produced definite leaf malformations as well as annular necrotic spots, symptoms not produced on this host by cucumber virus 1 [ibid., xvi, p. 132], the author concludes that under Italian conditions some other virus or viruses in addition to this one are responsible for the condition.

RIEHM (E.). **Das Pflanzenschutzgesetz.** [The Plant Protection Act.]—*Angew. Bot.*, xix, 2, pp. 97–101, 1937.

A brief retrospect is given of the various stages in the development of organized plant protection in Germany, culminating in the Reich Act for the Protection of Economic Agricultural Plants of 5th March, 1937 [*R.A.M.*, xvi, p. 576], the provisions of which are regarded as eminently suited to their purpose.

**Union of South Africa Proclamations 282, 283, 284, 285, 286, 287 of 1936.**—*Govt Gaz., Pretoria*, cvi, 2392, pp. 447–453, 1936. [Received May, 1937.]

The six proclamations (282 to 287, inclusive) of which the text is here given cover the quarantine restrictions against plant diseases at present (as from 6th November, 1936) existing in South Africa, earlier regulations under the Agricultural Pests Act [*R.A.M.*, iii, p. 752] being hereby repealed. Proclamation No. 286 prohibits the introduction into the Union of (*a*) apples, pears, quinces, or loquats from Japan, China, Manchukuo, or Eastern Siberia; (*b*) any plant or seed of any species of *Castanea* from North America or any other country known to harbour chestnut blight (*Endothia parasitica*); (*c*) similar material of *Ulmus* from Europe or any country where *Graphium* [*Ceratostomella*] *ulmi* has been found; (*d*) any tea plant or seed from India, Japan, or any other country where blister blight (*Exobasidium vexans*) occurs, unless accompanied by an official certificate guaranteeing the absence of the disease from a ten-mile radius of the place of cultivation; (*e*) tomato seed from Germany, Italy, North America, or other countries harbouring bacterial canker (*Aplanobacter michiganense*), unless accompanied by a health certificate, and rose plants from North America, Australia, or other countries in which a virus disease of roses is known to occur, the certificate proviso being applicable in this case also.

Duly authorized certificates must further accompany, *inter alia*, all consignments of (*a*) pome fruits (including ornamentals of *Pyrus* and related genera) from overseas, the Mandated Territory of South-West Africa, Portuguese East Africa, or any African State or territory north of the Zambesi, except Northern Rhodesia, Nyasaland, and the Belgian Congo, vouching for the absence of *Bacillus amylovorus* [*Erwinia amylovora*] from the place of cultivation; and (*b*) potatoes from the same countries stating that wart disease (*Synchytrium endobioticum*), at a date not exceeding 30 days before the time of dispatch, was not known to exist within five miles of the place of cultivation.